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REGIONAL VARIATION IN THE IMPACT OF MEDICARE PHYSICIAN PAYMENT REFORM

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I. INTRODUCTION

As part of the Omnibus Budget Reconciliation Act of 1989 (P.L. 101-289), Congress established a Medicare Fee Schedule (MFS) for physician services. The intent was to abandon the "customary, prevailing, and reasonable" methodology that resulted in fees that seemed, to many, to overcompensate physicians relative to resource costs for performing procedures and undercompensate for evaluation and management services. There were also concerns that fees often varied across localities without justifiable reasons. Beginning January 1, 1992, Medicare payments have been based on a resource-based relative value scale (Hsiao et al., 1988a, 1988b) adjusted for geographic differences in practice costs (Welch, Zuckerman, and Pope, 1989), as described in sections 1848 (a) through (e) of the Social Security Act. The MFS is part of a three-part payment reform package that also includes volume performance standards (section 1848 (f)) to control the growth of total program costs and limits on actual physician charges (section 1848 (g)) to protect beneficiaries from increase in extra billing, commonly referred to as balance billing.

Simulations by the Health Care Financing Administration (HCFA) indicate that the MFS, when fully implemented in 1996, will result in an average 6 percent reduction in average Medicare payments per service relative to a hypothetical continuance of the CPR approach.[1] However, this impact will not be felt uniformly across specialties or localities. In general,

[1]These same simulations suggest that the fully implemented MFS will be budget neutral with respect to Medicare outlays, which are projected to grow by 12 percent annually between 1991 and 1996. This growth is assumed to be due to payment updates, projected volume and intensity changes, and growth in beneficiary population. It is important to remember that actual outcomes could deviate from these projections if the various assumptions are not realized. For example, if deficit concerns led to slower fee updates than had been anticipated, the impact of the MFS would be greater and Medicare outlays would grow less rapidly.

surgical specialties will face reductions in average payments per service of over 15 percent. General and family practitioners, on the other hand, are likely to see payments per service rise by over 20 percent. Among localities, rural areas are expected to gain the most as a result of MFS, while large urban areas will have the biggest reductions.

There is some concern that Medicare beneficiaries living in areas that experience large reductions in average payments could face reduced access to care. The basic notion is that, as Medicare payment rates fall, the willingness of some physicians to supply services to Medicare beneficiaries could decline. These concerns led to a Congressional mandate to study issues related to the regional variation in the impact of the MFS. Specifically, Section 4115 of PL 101-508 called for a study of:

> (1) factors that may explain geographic variations in Medicare reasonable charges for physicians' services that are not attributable to variations in physician practice costs (including the supply of physicians in an area and area variations in the mix of services furnished;
>
> (2) the extent to which the geographic practice cost indices applied under the fee schedule established under section 1848 of the Social Security Act accurately reflect variations in practice costs and malpractice costs (and alternative sources of information upon which to base such indices);
>
> (3) the impact of the transition to a national, resource-based fee schedule for physicians' services under Medicare on access to physicians' services in areas that experience a disproportionately large reduction in payments for physicians' services under the fee schedule by reason of such variations; and
>
> (4) appropriate adjustments or modifications in the transition to, or manner of determining payments under, the fee schedule established under section 1848 of the Social Security Act, to compensate for such variations and ensure continued access to physicians' services for Medicare beneficiaries in such areas.

A. OVERVIEW OF THE STUDY

This report contains a series of separate analyses designed to address the issues in this mandate.[2] Each chapter of the report contains a study or set of studies focused on a distinct mandate question. Since the nature of the mandated report is oriented toward gathering new information on variation on the geographic impact of the current MFS, we do not develop or analyze fundamentally new approaches to geographically adjusting fees. Instead, we provide information that could be used as input into future refinements of the geographic adjusters.

Chapter II addresses the first area of the mandate by analyzing geographic variation in Medicare payment rates prior to the implementation of the MFS. Our objective is to determine what factors other than the Geographic Practice Cost Indices (GPCIs) are related to the observed patterns of Medicare fees. Potentially, this study could identify geographic adjusters to be used in the MFS in conjunction with the GPCIs. The analysis starts with a detailed review of the literature on the determinants of physician fees. This literature is used to derive an econometric model appropriate for explaining geographic variation. The parameters of the model are estimated using data from the 1989 BMAD Procedure File.

We turn our attention to the Overhead GPCI in Chapter III. In particular, we consider how accurately the components of the current OGPCI track variation in actual physician practice expenses across areas. This study is relevant to the second issue in the mandate because it contrasts geographic variation in the proxy sources of input price data used to construct the OGPCI with actual expenses. In addition, we are able to test the validity of the assumption that prices of medical equipment, medical supplies and other inputs are constant across areas. While

[2]The only issue cited in the mandate that is not addressed in this report relates to the accuracy of the malpractice costs adjustment. The malpractice GPCI is assessed in other studies (e.g., Zuckerman and Norton [1992] and Gillis, Reynolds, and Willke [1991]).

prices and expenses need not be perfectly correlated across areas, a close association would tend to refute claims that the use of proxy data produced an adjuster that does not reflect physicians' actual experiences. In this chapter of the report, we also review possible alternative sources of data for use in the OGPCI and assess whether their relationships to actual expenses are substantially stronger than those of the original proxy data.

The third area of the mandate--the issue of the impact of the transition to the MFS on access--is covered in Chapter IV. Given the timing of this report, it is obvious that we cannot analyze data on actual changes in utilization or other indicators of access among beneficiaries. Instead, we assess the potential for access reductions by comparing selected characteristics that describe the current access "environment" for localities expected to experience large reductions in Medicare payments per service with other localities. The characteristics we explore relate to health status, socioeconomic conditions, health service supply, physician practice styles, and the Medicare marketplace. Comparing localities expected to experience large Medicare payment rate reductions with other localities allows us to consider whether or not the various potential responses by physicians and beneficiaries to the MFS would be likely to create adverse implications for access. In so doing, we identify specific localities that should be closely monitored.

The final chapter of the report explores the impact of a limited number of alternative approaches to geographic adjustments in the MFS. Our goal is to show how a number of potential changes in Medicare payment policy could alter the impact of the MFS in those localities projected to experience the largest reductions in payments. Among the policy changes we consider are allowing the full geographic variation in work costs to be reflected in fees and

introducing an adjustment for overhead expenses other than employee wages, rents, and malpractice premiums.

B. SUMMARY OF RESULTS

The major findings of these studies are as follows:

- Based on the models we estimated, the GPCI is positively related to pre-MFS geographic variation in Medicare fees. This confirms the appropriateness of including a GPCI adjustment in the fee schedule.

- Other factors that are also positively related to Medicare fees prior to the MFS include, for example, population density, private insurers' fees, and physician supply. Because they are associated with the geographic distribution of fees prior to the MFS, they may also affect the likelihood or magnitude of relative gains and losses resulting from MFS. However, it seems unlikely the policymakers would want to increase payments based on area characteristics such as these.

- Our analysis of employee wage and office rent expenses shows that the proxy input price data used in the Overhead GPCI reflects the systematic geographic variation in actual expenses reasonably well. In fact, it appears that there may be greater variation in the OGPCI components than in actual expenses per unit of input. This suggests that physicians may alter their mix of inputs in response to input prices with high prices causing a shift toward lower priced inputs and vice-versa.

- These results suggest that practice cost adjusters for wages and rents based on actual expenses would be less variable than the ones based on price proxies. An "actual expense per unit of input" adjuster would result in even greater reductions in high-cost areas (e.g., Manhattan) and higher payments in low-cost areas (e.g., Arkansas).

- The data suggest that the assumption that the prices of medical equipment, medical supplies, and "other" expenses are uniform across areas may not be valid. While there are no credible proxy sources of price data for these inputs, an ad hoc adjuster could be derived based on either the Census wage data, the HUD fair market rents, or some combination of these sources. Obviously, these other overhead expenses are diverse, making any proxy hard to justify. In fact, there is no way to be certain that prices for other overhead and wages and/or rents are positively correlated. Moreover, if the goal is to acknowledge that transportation and delivery costs may result in higher overhead prices in rural or remote localities (e.g., Puerto Rico), an adjuster based on the wage or rent proxies would not be appropriate. However, if the variation in actual overhead expenses is to be a guide, the feasibility of some ad hoc adjuster based on wages and/or rents should be explored.

- Updating the fair market rent proxy to reflect rent variation as of 1990 (the most recent year available when this analysis was undertaken) has virtually no impact on the ability of the proxy to explain expenses and would have little impact on the overhead GPCI values or Medicare fees in most localities. To the extent that using the most recent data is desired, this suggests that updates could be undertaken without a great deal of redistribution across localities.

- Reviewing the characteristics of localities projected to experience large reductions in Medicare payments per service presents a mixed picture. Some indicators suggest access could be adversely affected under MFS, while others indicate there is relatively little need for concern. Concerns are raised by the fact that these larger reductions are occurring in areas with greater proportions of minorities and uninsured, higher inpatient casemix, and Medicare fees that are relatively low compared to the private market. However, on the other hand, the Medicare population in high-loss localities seems healthier (based on a set of indicators), has higher incomes, and has had much higher utilization rates than in other localities. This last point suggests that even if access were reduced, utilization could still remain at acceptable levels.

- Simulations show that changes in the geographic practice cost adjusters do not uniformly help all of the localities projected to experience large losses under the MFS. The reason for this is that a given change in the way one of the GPCIs is calculated may raise the index in some areas, but lower it in others. For example, including a full adjustment for the variation in physician time costs, as opposed to the 1/4 adjustment in the current rules, would reduce relative fee reductions in areas with work GPCIs that are above the national average. However, relative fee reductions would be greater in areas with work GPCIs that are below average.

- If there is evidence or concerns that access problems could be emerging, stopping the transition is a direct way to modify the MFS rules that will uniformly help all of the largest losing localities. Halting the transition affects fees on a service-by-service basis. Only those fees that are to be cut the most relative to CPR, i.e., those that had historically high charges relative to the MFS, would be raised. In this sense, the redistribution toward the largest losing localities would be targeted at those services that might be viewed as likely to see their supplies reduced. Another way to view this policy option is as a way of selectively blending the MFS and Medicare's historical charges. This approach, however, would also reduce the fee increases projected to occur in the localities likely to benefit from the MFS. At this point, changes in the transition for 1994 through 1996 would have a limited effect since over one-half of the transition will have been completed by 1993.

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II. DETERMINANTS OF VARIATION IN MEDICARE REASONABLE CHARGES[1]

The Congressional mandate described in Chapter I includes an analysis of "factors that may explain geographic variations in Medicare reasonable charges [payments prior to the implementation of the Medicare fee schedule] that are not attributable to variations in physician practice costs...."[2] Prior research indicates that practice cost variations do not fully explain geographic variations in Medicare's payments to physicians prior to the implementation of the Medicare fee schedule (Pope et al. 1989).[3] The unexplained variation raises two questions. First, do factors other than practice costs systematically influence the variation observed in Medicare's payments to physicians prior to the implementation of fee schedule?

The second question is, if factors other than practice input costs are systematically related to geographic variation in Medicare's payments to physicians, should these other factors be the basis for additional adjustments to the fee schedule? DRG payments under the Medicare Prospective Payment System (PPS) for hospitals provide a precedent for such adjustments. In the same way that the Medicare fee schedule adjusts payments to physicians for input costs using a practice cost index, PPS adjusts payments to hospitals for their input costs using the Area Wage Index. Two additional factors, indirect teaching and the share of a hospital's patients that were covered by Medicare and Medicaid, were determined to influence hospitals' costs per case.

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[1]This chapter was written by Martcia Wade.

[2]Section 4115(a) of OBRA 1990 (P.L. 101-508).

[3]Similarly, studies found that hospitals' input costs did not fully explain variation in hospitals' Medicare charges prior to the implementation of Medicare's Prospective Payment System.

Subsequently, they were designated as appropriate adjustors for DRG payments, in addition to the Area Wage Index.

Towards answering these questions, this chapter analyzes geographic variation in Medicare's payments to physicians prior to the implementation of the fee schedule. Section A of this analysis reviews the literature to identify determinants of prices.[4] Although much of this literature is not specific to Medicare payment, it provides a framework with which to begin to analyze the determinants of Medicare's payments to physicians. This analysis provides an opportunity to assess the applicability of the literature to Medicare payment levels.

Section B specifies a reduced form model of Medicare's payments to physicians. The results of the model estimation, reported in Section C, are often consistent with the theoretical predictions and previous empirical analyses in the literature's models of physician pricing. For example, physicians' practice costs, the supply of physicians, and demand factors (e.g., consumer information and health insurance) generally are found to be significantly related to Medicare's payments. None of these factors is an obvious candidate for adjusting payments under the Medicare fee schedule. Section D begins to consider whether any of these factors <u>should</u> be used as adjustors.

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[4]The Scope of Work for this project requires "a review of . . . research literature concerning factors other than variation in physician practice costs that may (or appear to) explain variations in Medicare reasonable charges . . . ."

A. LITERATURE REVIEW

The objective of this literature review is to identify potential determinants of Medicare's physician payment rates. The literature specific to Medicare payment rates is somewhat limited for this purpose. Muller et al. (1979) analyze the effects of Medicare carrier practices on Medicare's payments to physicians. In general, Muller et al. do not find a significant relationship between carrier practices and Medicare's payment levels. However, the analysis appears to be limited by the omission from the empirical model of important variables, e.g., a measure of physician practice costs. Gornick et al. (1980) analyze potential determinants of variations in Medicare payment rates for physicians' service. Unfortunately, the use of univariate analysis limits the ability to make inferences regarding the independent effects of potential determinants. Cromwell and Mitchell (1986) analyze Medicare's payment rates to test the theory of supplier-induced demand for surgery. (Elements of Cromwell and Mitchell (1986) are discussed in greater detail below.)

In the absence of a significant body of research on Medicare's physician payment rates, this section reviews the broader, refereed literature on physician pricing to identify potential determinants. Section B's discussion of the chapter's analytical approach briefly discusses the potential applicability of the literature to the analysis of Medicare payment levels. The subsequent empirical analysis essentially tests the hypothesis that determinants of fees in the private market are the determinants of "fees" in the Medicare market.

This section also briefly reviews the literature on two other, related topics. The first is methodological issues in the estimation of physician payment rate models. The second is the literature's measurement of physician fee levels.

Determinants of Physicians' Fees

The literature reviewed identifies potential determinants of physicians' fees from two sources. The first source is economic theory, including both general models of economic markets and economic models that incorporate unique characteristics of the health care market. The second is empirical analysis. Numerous factors have been suggested to be potential determinants of physician fee levels. They range from input costs and demand factors to a physician's political attitudes and inpatient days per capita in an area. Appendix A enumerates factors identified as potential fee determinants in both refereed and non-refereed literature. The appendix summarizes the empirical literature's findings with respect to these factors' relationship to fees and cites the references that include a given factor.

Some of the literature on physician fees debates the appropriateness of alternative theoretical models of physician behavior.[5] The discussion focuses upon whether the market is perfectly competitive or monopolistically competitive; more generally, whether physicians are price-takers or price-setters. The debate includes consideration of the target income and supplier-induced demand models of physician behavior (e.g., Farley 1986 and Evans 1974).

In some cases, the various models of physician behavior imply different determinants of physician pricing. For example, measures of consumer information are relevant under Pauly and Satterthwaite's (1981) increasing monopoly model, but are not relevant under perfect competition. Perfect competition assumes perfect information. This review refers to theoretical models of physician behavior only as they relate to potential determinants of fee levels. In addition, this

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[5]Hoerger (1984) provides a comprehensive overview of alternative theories of physician fee setting.

review does not include the literature on physicians' behavioral response to changes in insurers' payment levels (e.g., Gable and Rice 1985 and McGuire and Pauly 1991).

Economic Theory: General Models of Economic Markets

Economic theory identifies three important determinants of physicians' fees: input costs, consumer demand, and the supply of substitutes or complements for physician services. The first determinant, a supply side factor, is the cost of inputs required to produce physician services. The standard inputs identified in the literature include non-physician labor (e.g., nurses, receptionists, and/or technicians), office rents, capital costs, and malpractice and other insurance expenses. The empirical measures of input costs include average wages for production workers (Pauly and Satterthwaite 1981), average costs per medical practice employee (Lee and Hadley 1981; Steinwald and Sloan 1974), retail wage rates (Cromwell and Mitchell 1986), hospital wages (Sloan 1982), and average malpractice premiums (Lee and Hadley 1981). However measured, input costs are almost uniformly found to be significantly[6] and positively related to fees.[7]

The literature sometimes includes hospital supply as an input factor (e.g., Custer 1986 and Cromwell and Mitchell 1986). The literature suggests that hospital or hospital sector characteristics may influence physician fee levels. The body of research, however, is not well established and sufficiently small that the results are not considered to be conclusive.

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[6]"Significantly related" and "significantly associated" mean a statistically significant relationship.

[7]An example of an exception to this general result is Cromwell and Mitchell (1986). In Cromwell and Mitchell's analysis the cost of non-physician input (measured by retail wage rates) is not significantly related to fees. The authors note, however, that these "results should be interpreted cautiously" (p. 304) because of multicollinearity problems.

Two examples illustrate conceptualizations of hospital supply as an input factor. First, Custer (1986) models the characteristics of the hospital with which a physician is affiliated as a quality enhancing input to the physician's production function.[8] Custer's (1986) empirical results are generally consistent with the theoretical model's predictions.[9] Several measures of a hospital's capacity, that is, the resources devoted to each patient, were found to be significantly and positively related to physician fees, measured by the price of a follow-up visit. The measures included, for example, the number of hospital employees per bed, whether the hospital was for-profit, and an indicator of whether the hospital was growing. The measure of a hospital's competition for physicians, the hospital-physician ratio, was negatively and significantly related to fees. However, the measure of a hospital's scope, that is, the range of services available in the hospital, was not significantly related to fees. In addition, the coefficient for the hospital occupancy rate variable, another measure of the hospital's capacity, was statistically significant and negative rather than positive, as predicted by Custer's theory.

A second example of a conceptualization of hospital factors as an input factor for physicians services appears in Cromwell and Mitchell (1986). Cromwell and Mitchell argue that, as hospital bed supply increases, surgeons admit more patients to hospitals and perform more surgeries. The authors generally predict that all variables "entering the supply equation positively

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[8]In Custer's (1986) theoretical model, hospital characteristics are arguments of all economic agents' utility or profit functions. Consumers choose physicians based upon their office characteristics and the characteristics of the hospital with which they are affiliated. In the model, hospitals' economic objectives are served by attracting physicians. And, the ability to do so depends upon the hospitals' characteristics. Custer's theoretical analysis assumes that the physician services market is perfectly competitive. However, the argued relationship between hospitals and physician fees seems generalizable to other models of physician behavior.

[9]Custer's (1986) empirical specification omits standard measures of the cost of inputs and omits any measures of insurance coverage.

should depress prices."[10] Presumably, that is, all factors positively correlated with supply will be negatively correlated with prices. More beds per capita apparently imply more surgery. Therefore, the expected relationship between hospital bed supply and price is negative. In Cromwell and Mitchell's empirical analysis, consistent with their expectations, hospital bed supply and physician fees are significantly and negatively related.

The second determinant identified from general models of economic markets is consumer demand. Consumer demand is typically measured empirically by patient or population characteristics. The standard characteristics include, for example, age distribution, race, education, and income. Cromwell and Mitchell (1986) also include measures of the time price of services in their empirical model of surgeons' fees.[11]

Among these standard consumer demand variables, income is fairly consistently found to be positively and significantly related to physician fee levels (e.g., Steinwald and Sloan 1974; Pauly and Satterthwaite 1981; Sloan 1982; and Cromwell and Mitchell 1982). In the case of the other demand variables, the results are sometimes inconsistent with theoretical expectations or across studies. For example, Pauly and Satterthwaite find the percentage of the population over 65 years old to be positively and significantly related to fees. Cromwell and Mitchell (1982), however, report a statistically significant negative relationship between physician fees and the age distribution. Contrary to the expectations of the consumer demand literature, Cromwell and Mitchell report a statistically significant and negative relationship between physician fees and education. In part, they attribute these unexpected results to multicollinearity problems. In

[10] Cromwell and Mitchell (1986), p. 304.

[11] The time price measures are market area occupation distribution and employment status. The rationale is that employees in higher paying occupations value their time more than others.

addition, Cromwell and Mitchell question the appropriateness of the model's assumption that the market is in equilibrium.[12]

The supply of physicians, i.e., the physician-to-population ratio, is sometimes used as an indicator of consumer demand. In fact, Lee and Hadley's (1981) only measure of consumer demand is the supply of physicians. The argument for using physician supply to measure consumer demand assumes that physician supply adjusts "to equilibrate cross-sectional variations in demand . . . ."[13] Lee and Hadley subsequently argue that inclusion of other demand variables would be redundant.

The physician-to-population ratio is also used to control for general market characteristics (e.g., Wilensky and Rossiter 1983 and Pauly and Satterthwaite 1981), not solely as a measure of consumer demand. In these cases, its expected relationship to fees may depend upon the assumed model of the market for physician services. For example, if the market is perfectly competitive, the expected relationship is negative. The target income (Evans 1974) and increasing monopoly models (Pauly and Satterthwaite 1981) predict a positive relationship between fees and physician supply.

The empirical results on physician supply are mixed. In some instances, the relationship between supply and fee levels has been found to be positive and statistically significant (e.g., Custer 1986 and Cromwell and Mitchell 1986). In other instances, it has been found to be negative and statistically significant (e.g., Lee and Hadley 1981 and Sloan 1982). These mixed results may be attributable to any one of several factors, ranging from differences in model

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[12]Cromwell and Mitchell (1982) subsequently estimate a disequilibrium model of the rate of surgery. (They do not, however, estimate a disequilibrium model of physician fees.) Cromwell and Mitchell report that their basic findings were the same in the disequilibrium framework as in the equilibrium framework.

[13]Lee and Hadley (1981), p. 192.

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specification (perhaps deriving from differences in assumed models of physician pricing behavior) to the unit of analysis.

The other general market characteristic that appears in the literature is whether a market area is urban or rural. Wilensky and Rossiter (1983) find urban areas to have significantly higher fees than rural areas.

The third determinant identified from general models of economic markets is the price or supply of complements or substitutes for physicians' services. The empirical literature on physician fees does not always account for these factors. Cromwell and Mitchell (1986) is one of the few empirical analyses that explicitly incorporates substitutes for a physician service. Their analysis of the market for surgeons' services includes the supply of general practitioners as a measure of substitutes for surgeons. Frank's (1985) theoretical model and empirical analysis of the pricing of psychiatrists' services includes measures of their substitutes and complements. Whether the omission of these factors elsewhere is intentional or unintentional is not clear. For example, substitutes may be intentionally omitted because they do not generally exist for physicians' services or because they are not significant in exploratory analyses.

Economic Theory: Economic Models of Health Care Markets

The literature has also developed theory that incorporates characteristics unique to the health services market. Two theoretical developments in the health economics literature pertain to determinants of physician fees. One development focuses upon the effects of insurance on fees for physician services. Insurance-related issues assume particular importance because of their potential contribution to rapidly rising fees and expenditures for medical care. Sloan (1982) theoretically models the effects of insurance on physicians' fees for their own services in a multi-

market context. In this model, physicians simultaneously operate in the publicly insured markets (where consumers are insured through Medicaid or Medicare) and in the markets in which consumers are covered by private insurance or pay privately for services. The theoretical model unambiguously predicts that physician fee levels will be positively related to both the level of insurers' payments for services and the proportion of patients with health insurance. The accompanying empirical analysis is generally consistent with the theoretical model's predictions. Insurers' payments under their fee schedules and the percentage of patients with private health insurance and Medicare coverage were significantly and positively related to fees.

Steinwald and Sloan (1974) also find some measures of an area's health insurance coverage to be significantly related to fees. In their analysis, the proportion of the population with major medical insurance is almost always positively and significantly related to fees. For some specific procedures, the insurer's payment level is positively related to the physician's fee for that procedure.[14]

Lee and Hadley (1981) extend the multimarket model of physician behavior to a multiperiod model. The multiperiod extension's significance is that it relates public payments based on a customary, prevailing, or reasonable (CPR) system to private fee levels.[15] Lee and Hadley's (1981) model predicts that physicians will set private prices at higher than optimal levels in the current period in order to increase future CPR payments from public payers and total

[14]Steinwald and Sloan's analysis also includes two other measures of insurance coverage: (1) the percentage of a state's total health insurance benefits that were paid by commercial insurers and (2) the percentage of the population under 65 years of age with regular medical or surgical coverage. These variables' estimated coefficients are either not of the expected sign or their signs varied over the equations estimated. In part, the authors attribute these inconclusive or inconsistent results to multicollinearity problems.

[15]Under the CPR system, the insurer pays the minimum of the physician's actual charge, customary charge, or the prevailing charge in the physician's area. The reasonable charge is the minimum of these three amounts and is the amount paid by the insurer.

future profits. The magnitude of the current mark-up is determined by physicians' expectations about input cost increases and limits on the growth of CPR payments. Lee and Hadley's empirical analyses support these expectations.

The second theoretical development in the health economics literature relates to the role of information. This development assumes that the market for physician services is not perfectly competitive.[16] Satterthwaite's (1979) increasing monopoly model predicts that, as the total number of physicians increases, the cost to consumers of acquiring information in their search for a physician also increases. As a result of higher search costs, Satterthwaite predicts that consumers' sensitivity to the price of services will decrease and, consequently, the market price of physician services may increase. Pauly and Satterthwaite's (1981) empirical test of the increasing monopoly model includes several measures of the degree of consumer information as explanatory variables. Among the measures are physician density and population density, respectively, physicians and population per square mile of an urbanized area. Physicians per square mile was found to be significantly and positively related to the prices of physicians services. Population per square mile was found to be significantly and negatively related to prices.

Sloan (1982) found population per square mile to be positively and significantly related to fees. Controlling for other factors, Sloan includes this population density variable as a measure of consumer demand. However, it is unclear whether it is intended as a measure of information aspects of consumer demand.

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[16]However, consumer information may be a determinant of physician fees under the simple assumption of price-taking, an assumption that is much less restrictive than perfect competition.

Other Determinants of Physician Fees

Empirical analyses of physician fees sometimes include physicians' personal and practice characteristics to control for "product differences." Personal characteristics often include specialty, age or experience, and whether the physician is board certified, a foreign medical graduate, and has a medical faculty appointment.[17] Practice characteristics often relate to the size of a physician's practice and, in the case of group practices, expense or revenue sharing arrangements.

The literature provides two types of evidence that physician specialty may affect fee levels. One type of evidence is provided by studies which aggregate data over specialties and include a measure of the specialty distribution in the analyses. For example, Pauly and Satterthwaite (1981) estimate a model of pricing with data that aggregates across primary care physician specialties. The model, however, includes the percentage of physicians who are general practitioners as an explanatory factor and finds it to be significantly and negatively related to physician fees. Wilensky and Rossiter (1983) employ a similar approach, using a set of indicator variables to control for an individual physician's specialty. The estimated coefficients of several of the specialty indicator variables are statistically significant.

The second type of evidence that specialty affects physician fee levels is indirectly provided by studies that estimate pricing models separately for various specialty groups. Steinwald and Sloan (1974), for example, estimate their model for five different specialties. Their measure of input costs (i.e., the cost of practice employees) is positively and significantly related to office visit fees for all specialties. The magnitude of the relationship, however, varies

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[17]Redisch, Gabel, and Blaxall's (1981) set of personal characteristics also includes the physician's health status, political attitudes, family status, and income from sources other than medical practice.

by specialty. The coefficient for pediatricians is half the magnitude of the coefficient for general surgeons. The results suggest that the relationships between physician fees and their determinants vary by specialty.

Frank (1985) provides several arguments for estimation of pricing models separately by specialty group. One argument, for example, is based on the assumption that interrelationships exist among medical specialties. Assume, for example, that general practitioners and internists are complements. Frank suggests that, in direct response to an increase in the supply of general practitioners, prices for their own services will decrease. However, their increased supply may also result in greater demand for internists' services and, consequently, an increase in internists' fees. Frank concludes that, depending on the mix of physicians in an area, empirical results on the relationship between fees and physician supply may be misleading if based upon data aggregated across specialties.

The empirical results for the other physician characteristics are generally inconclusive or inconsistent in the refereed literature. In some cases, the expected relationship between the physician characteristics and fee levels is ambiguous. Perhaps consequently, the empirical results are frequently inconclusive. For example, Steinwald and Sloan (1974) describe the inclusion of revenue-sharing in their physician pricing model as tentative because its expected effects are ambiguous. On one hand, they argue that revenue-sharing may be associated with larger practices and, consequently, economies of scale and lower fees. On the other hand, they argue that, among other factors, the costs of joint decision-making for a group may increase the price of services. Steinwald and Sloan's empirical results are inconclusive. In Sloan (1982), however, the number of physicians in a practice is significantly related to fees. Sloan's results suggest that

a solo practitioner's fees will tend to be greater than the fees for a practice with two to five physicians.[18]

The expected relationship between age or experience and fees is also ambiguous. On the one hand, the literature argues that greater experience or age is associated with higher quality. Therefore, more years of experience would be associated with higher fees. On the other hand, others, such as Custer (1986), argue that experience and fees are inversely related. The rationale apparently is that more experienced physicians are more efficient. Consequently, the price per unit of service provided by a more experienced physician is less than the price of the service provided by a less experienced physician.

In the refereed literature, the empirical results on age and experience are inconclusive, as is consistent with the ambiguous expectations. Sloan (1982) finds that physicians with more than 35 years of experience have significantly lower fees for visits than other physicians.[19] In Steinwald and Sloan (1974) and Wilensky and Rossiter (1983), age or experience are rarely significantly related to fees. Lee and Hadley's (1981) results vary by specialty. In the price equation for general practitioners, more experience is significantly associated with lower fees. In the equation for general surgeons and internal medicine specialists, more experience is significantly associated with higher fees.

Empirical results are often mixed even when the expected relationship is unambiguous. For example, board certification and faculty appointments are expected to be associated with

[18]The author reports this result without explanation. One reviewer suggests that this result may reflect economies of scale in group practice.

[19]One reviewer points out that, under Medicare's reimbursement policy prior to the implementation of the Medicare fee schedule, a physician's Medicare charge history would influence current charge. As a consequence of the reimbursement policy, newer physicians may have higher Medicare charges than older physicians.

higher quality and, thus, higher prices. In Sloan (1982), these variables are statistically significant and usually positively related to fees for physician visits. However, these variables are never significant in Steinwald and Sloan (1974).

Custer's (1986) analysis is the only one of the reviewed articles that includes a case-mix measure to control for product differences among physicians.[20] Reasoning that more complex cases require more information, Custer uses the percentage of patients who receive x-rays as a measure of case-mix and finds it to be statistically significant and positively related to physician fee levels. It should be noted that the broader health services literature provides conceptually more appropriate measures of case-mix than Custer's measure.

Methodological Issues

Three methodological concerns stand out in the literature. One concern is whether to treat physician supply as an endogenous or exogenous factor.[21] Whether physician supply is exogenous or endogenous has been suggested as an explanation for conflicting results in the empirical literature. Some studies have found physician supply to be positively related to fees. Others have found physician supply to be negatively related to fees.

The literature has begun to define parameters that may indicate whether the appropriate assumption is endogeneity or exogeneity. Two examples of parameters follow. One parameter is

[20]The main points of Custer's analysis are discussed in the section on "Economic Theory: General Models of Economic Markets."

[21]An endogenous variable is one whose value is determined simultaneously with the dependent variable of interest, in this case, physicians' fees. An exogenous variable is one that is not influenced by the factors that affect the variable of interest. Whether an explanatory or independent factor is exogenous or endogenous has implications for model estimation. If an endogenous variable is used as an independent variable in a model, OLS estimation of the model will produced biased parameter estimates.

the unit of observation. Lee and Hadley (1981) argue that the supply of physicians is strictly exogenous to pricing behavior when the unit of observation is the individual physician.

However, empirical research that assumes exogeneity in the analysis of individual data does not yield consistent results. For example, on the one hand, Lee and Hadley (1981) and Sloan (1982) find a negative relationship between supply and physicians' fees. On the other hand, Wilensky and Rossiter (1983) also assume exogeneity and use individual data, but report a positive and statistically insignificant relationship between fees and supply.

Similarly, consistent results are not evident in analyses of aggregate data. In their analyses, both Cromwell and Mitchell (1986) and Pauly and Satterthwaite (1981) treat the supply of physicians as endogenous. Cromwell and Mitchell (1986) report a positive and significant relationship between supply and fees. Pauly and Satterthwaite (1981) report a negative and significant relationship between supply and fees in their increasing monopoly model.[22]

The second parameter that is argued to influence whether the supply of physicians is endogenous or exogenous is whether the model is short-run or long-run. Frank (1985) argues that physician supply is endogenous in short-run models of physician pricing.

The assumption of long-run exogeneity of the supply of physicians appears to be consistent with the process by which the supply of physicians is determined at a point in time. For example, at a point in time, the number of physicians observed is influenced primarily by the demand for and supply of medical education several years earlier. The literature on the market

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[22]Pauly and Satterthwaite (1981) argue that the level of physicians' fees in an area is an important determinant of physicians' location decisions and, consequently, an area's supply of physicians. This endogeneity argument is consistent with the literature on physician location or the geographic distribution of physicians. The literature on physician location suggests that, in addition to fees or income, factors such as individual physician characteristics and area characteristics are important determinants of the distribution of physicians (e.g., Newhouse et al. 1982 and Feldman 1979).

for medical education indicates several factors that influence the number of medical students (e.g., Sloan 1971). Those factors include, for example, physicians' versus alternative professions' salaries, the cost of medical education, and the size of the college-aged population. Expected levels of payments for physicians' services seem to be relevant only insofar as they influence physicians' incomes relative to the incomes in alternative professions at the time an individual applies to medical school.

In sum, then, some of the literature suggests that physician supply is exogenous when the unit of analysis is the individual physician. The literature also suggests that whether the analysis is short-run or long-run influences whether to view the supply of physicians as endogenous or exogenous. However, neither case is very rigorously developed in the literature.

The second methodological concern is multicollinearity among explanatory variables. For example, both Steinwald and Sloan (1974) and Cromwell and Mitchell (1986) note the existence of multicollinearity in their analyses.

The third methodological concern is specification error, particularly omitted variables (Frank 1985). Two examples from the literature reviewed illustrate potential omitted variable problems. Custer's (1986) empirical analysis omits standard input costs and health insurance variables. Wilensky and Rossiter's (1983) analysis omits measures of input cost and of consumer demand.[23]

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[23]Wilensky and Rossiter (1983) include physician supply as an explanatory variable, though apparently not as a demand variable.

Measurement of Physician Fee Levels

Two approaches for measuring fee levels appear in the literature. The most commonly used measure of physicians' fees in the literature is the price for a single service, usually a follow-up office or hospital visit or an initial office visit (Custer 1986; Pauly and Satterthwaite 1981; Redisch, Gabel, and Blaxall 1981; Sloan 1982; Steinwald and Sloan 1974; and Wilensky and Rossiter 1983). In a few cases the literature estimates models of the price of a specific procedure, such as, an appendectomy, gall bladder removal, or electrocardiogram (e.g., Sloan 1982 and Steinwald and Sloan 1974). Survey data is the usual source for these measures.

Only a small number of studies use alternative measures based upon fees for a range of procedures. For example, Lee and Hadley (1981) use billed charges per relative value unit as a measure of physicians' fees. Cromwell and Mitchell (1986) use a surgical fee index.[24] These broad-based measures usually require detailed claims or charge data (rather than survey data). Interestingly, the literature has not discussed the implications of these alternative approaches for the empirical analysis of physician fee levels.

Summary

The refereed literature identifies several factors that may be related to variation in physicians' fees. Those factors that derive from economic theory are most likely to be statistically significant in empirical analyses. With the exception of physician specialty, factors included in empirical analyses without formal theoretical bases tend to produce inconsistent or insignificant results.

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[24]Although fee indices are usually broadly based, Cromwell and Mitchell's (1986) is based upon national expenditure weights for only six common surgical procedures.

The factors identified from general theoretical models of economic markets are input costs, consumer demand, and the supply of complements or substitutes for physicians services. These determinants largely are independent of the assumed economic model of physician behavior. That is, whether physicians are price-takers or price-setters, these three items are potentially important determinants of fees.

Standard measures of input costs and demand factors are almost always significantly related to fees in empirical analyses. Standard measures of input costs include, for example, wages for medical practice employees and malpractice premiums. A typical demand measure is income. The results for non-standard measures and for measures of complements and substitutes are few in number. Consequently, generalization about alternative determinants or measures is difficult.

The potential determinants of physician fees identified from theoretical models of health care markets include private and public insurance payment levels and the proportion of consumers with private and public insurance. This literature also suggests that consumer information may be a determinant of fee levels. Both insurance and consumer information variables have been found to be statistically significant when included in empirical analyses of physician pricing.

In some cases, the literature on physician pricing can be difficult to interpret. Two examples illustrate this point. First, empirical analyses sometimes include potential fee determinants, or explanatory factors, without clarifying their expected relationship to fees. For example, Wilensky and Rossiter (1983), without explanation, include the number of patient visits in the office in their estimated model of physician fees. Second, a single measure may be used to represent different explanatory factors in different analyses. For example, in Lee and Hadley

(1981), physicians per capita is a measure of consumer demand. Elsewhere (e.g., Wilensky and Rossiter 1983 and Pauly and Satterthwaite 1981), physicians per capita apparently is not intended to be a demand factor. In these cases, evaluation of the internal consistency of the analysis and/or its consistency with other results in the literature is difficult.[25]

B. ANALYTICAL APPROACH

The following analysis of geographic variation in Medicare payments for physician services builds upon the findings of the literature review. In particular, the empirical model attempts to incorporate those factors that the literature has identified as significant determinants of physicians' fees. This section discusses the model specification, data sources, and model estimation. This section discusses the model specification, data sources, and model estimation.

The analysis builds on the literature on physician pricing primarily in private markets. However, Medicare allowed charges differ from private market fees in several ways. For example, between 1987 and 1991, Medicare policy imposed Maximum Allowable Actual Charge (MAAC) limits. These limits on Medicare's physician payments have affected their relationship to payments in the private market. Nevertheless, Medicare and private payment levels may be sufficiently related to justify exploring the explanatory ability of private fee models. The theoretical literature suggests a relationship between Medicare payment levels and physicians' fees in the private market (Lee and Hadley 1981). Moreover, Medicare payment and private charge levels are empirically correlated. The correlation between an index of physicians' 1990 private fees and indices of Medicare allowed charges is in the neighborhood of 0.75 and is

[25] This difficulty is also evident in Appendix A's overview of the refereed and non-refereed literature.

statistically significant. It should also be noted that the analysis is applying a literature on individual physician behavior to an area level analysis.

Model Specification

The empirical specification is a reduced form linear model. The model is cross-sectional, describing the long-run behavior of Medicare payment rates. The general form of the model is

$$p = a_0 + \sum_{j=1}^{n} b_j x_j .$$

The model's dependent variable is p, a measure of Medicare payment levels. x_j, j=1,...,n denotes the model's independent variables. The independent variables include both supply and demand factors. The dependent and independent variables are discussed in the following section and are listed in Table II.1. Variable means and standard deviations are listed in Table II.2. The coefficients to be estimated are a_o and b_j, j=1,...,n.

The unit of analysis is the Medicare pricing locality. A pricing locality is a geographic area defined by a Medicare carrier, a processor of Medicare Part B claims. The pricing locality is the geographic area for which prevailing charges were determined for the application of the reasonable charge methodology. The Medicare pricing locality is also the geographic area to which the practice cost index, the GPCI, is applied. It should be noted that the configuration of payment localities varies considerably. In some instances an entire state comprises a payment locality. In other cases, individual cities, individual counties, multiple cities, contiguous or

Table II.1

Variable Description and Data Source

VARIABLE NAMES	DESCRIPTION	DATA SOURCE[a]
	Dependent Variables	
LASPEYRE	Laspeyres index, 1990	BMAD
FISCHERS	Fischer's Ideal index, 1990	BMAD
RVUCHG[b]	Average allowed charges per RVU, 1990	BMAD and HCFA (1991a)
Procedure[b]	Average allowed charge per unit of service, 1990	BMAD
	Independent Variables	
Supply Factors & Physician Characteristics		
GPCI	Geographic Practice Cost Index (GPCI)	UI
MDOVER65	Percent of patient care MDs 65 years or older, 1989	ARF
MDGENFAM	General/family practitioners as a percent of patient care MDs, 1989	ARF
MDTEACH	Teaching MDs as a percent of patient care MDs, 1989	ARF
Consumer Demand		
General Demand Factors		
INCOME	Per capita income (in thousands of dollars), 1989	ARF
%WHITE	Percent of population over 64 years that is white, 1990	ARF
AGE75-84	Percent of population over 64 years that is aged 75-84 years, 1990	ARF
AGE65-74	Percent of population over 64 years that is aged 65-74 years, 1990	ARF
Consumer Information		
MD_MILE	Patient care physicians per square mile, 1989	ARF
POP_MILE	Population per square mile, 1990	ARF
Health Insurance		
PRIVATE	Percent of population covered by private insurance only or by private insurance and Medicaid, 1989-91	CPS
PRIVFEE[b]	Private charge index	HIAA
General Market Characteristics		
MDSUPPLY	Total patient care physicians per 1000 population, 1989	ARF
RVUSVC[b]	Average RVUs per unit of service, 1990	BMAD
OVERPRIC	Expenditures for "over-priced" procedures as a percent of total Medicare expenditures, 1990	BMAD

Notes:

a. BMAD=Part B, Medicare Annual Data, UI=Urban Institute, ARF=Area Resource File, CPS=Current Population Survey, HIAA=Health Insurance Association of America.

b. This variable is measured relative to its national average value.

Table II.2

Variable Means and Standard Deviations

VARIABLE NAMES	MEAN (n=237)	STANDARD DEVIATION
	Dependent Variables[a]	
LASPEYRE	.957	.163
FISCHERS	.995	.139
RVUCHG	.940	.150
	Independent Variables	
Supply Factors & Physician Characteristics		
GPCI	.975	.067
MDOVER65	.170	.046
MDGENFAM	.200	.107
MDTEACH	.012	.011
Consumer Demand		
General Demand Factors		
INCOME	16.534	3.610
%WHITE	.900	.094
AGE75-84	.321	.017
AGE65-74	.579	.029
Consumer Information		
MD_MILE	3.776	35.301
POP_MILE	853.844	4665.990
Health Insurance		
PRIVATE	.620	.076
PRIVFEE	.967	.111
General Market Characteristics		
MDSUPPLY	1.752	1.013
RVUSVC	1.021	.172
OVERPRIC	.214	.047

Note:

a. Locality level observations are not weighted by locality characteristics such as Medicare population size, total Medicare payments, or land area. This is evident in Table II.2. If the locality level observations were weighted, the dependent variables' means would be 1.0. The fact that they are less than 1.0 indicates that the number of localities with Medicare charges below the national average is greater than the number of localities with charges above the national average.

discontiguous counties, or regions may comprise a locality. The data sample is composed of 237 localities.[26]

Dependent Variables. Prior to the implementation of the fee schedule, Medicare payments to physicians were based upon a reasonable charge criterion. A reasonable charge for a service is the minimum of the physician's actual charge, the physician's customary charge, or the prevailing charge for that service in the area in which the physician practices.

The analysis uses a pricing locality's average allowed Medicare charges as the measure of reasonable charges.[27] Allowed charges are Medicare's payments to physicians after application of the reasonable payment criterion. Allowed charges do not include balance billing of Medicare beneficiaries by physicians.[28] Allowed charges do include coinsurance on claims paid or submitted toward the deductible.

Three approaches will be used to measure Medicare average allowed charge levels. The first approach is based upon a large number of procedures (rather than a small subset of procedures). It converts the various services provided by physicians into a common unit of measure and computes the average allowed charge per unit. The Resource-Based Relative Value System, upon which the Medicare fee schedule is based, provides that common unit of measure, the total relative value unit (RVU). Specifically, the model's dependent variable is average

[26]The sample excludes Puerto Rico, the Virgin Islands, and other localities for which GPCIs do not exist. That latter includes, for example, the Travelers-Railroad locality, some localities that are recognized by carriers only, and carrier-wide localities. Claims for carrier-wide are allocated among carrier localities for which GPCIs exist. It should be noted the localities at the time of the Medicare Fee Schedule differ in some ways from the 1990 localities used in the analysis.

[27]Allowed charges within localities vary significantly.

[28]Balance billing refers to the situation in which a physician bills the individual Medicare beneficiary for the difference between the physician's charge for the service and Medicare's reasonable charge. This occurs only when a claim is not assigned.

allowed charges per RVU.[29] This measure will be normalized in this analysis. The normalized value is the ratio of a locality's average allowed charge per RVU to the national average allowed charge per RVU. All procedures provided by physicians to Medicare beneficiaries, except services provided by anesthesiologists, are included in the computation of this measure.

The second approach for measuring Medicare average allowed charge levels is also broad-based. The measure is a price index. Indices are necessary when a common unit of measure for different services (such as an RVU) does not exist. They essentially hold quantities of various services constant so that price differences across time or across areas can be isolated. Several problems may arise in the determination of price indices for medical services that do not arise when a common unit of measure (such as the RVU) is available. The problems include the lack of prices in all areas for all services in a representative market basket and lack of comparability of indices across areas.

The model will be estimated using two different price indices, the Fisher's Ideal index and a separate, or stand-alone, Laspeyres index.[30] The Fisher's Ideal index takes into account a locality's weights for services provided in an area as well as national weights for those same services. It is the geometric mean of a Laspeyres index and a Paasche index. The formula for Fisher's Ideal index is

$$FI_j = [L_j \times P_j]^{1/2}$$

where Lj is the Laspeyres index for locality j and P_j is the Paasche index for locality j, $j=1,...,J$.

[29]If an RVU does not exist for a given service, its value is estimated to be the quotient of the average allowed charge for the service and the Medicare fee schedule's conversion factor ($31.001). Under the Medicare fee schedule, the conversion factor is used to translate geographically adjusted RVUs into dollar amounts.

[30]Zuckerman and Holahan (1991) argue that Fisher's Ideal is the most appropriate index for measuring geographic variation in Medicare prices for physician services. The appendix of Zuckerman and Holahan (1991) discusses the assumptions and implications of alternative price indices.

The equations for the component indices are

$$L_j = \sum_{i=1}^{I} w_{il} \frac{p_{ij}}{p_{il}}$$

and

$$P_j = \left[\sum_{i=1}^{I} w_{ij} \frac{p_{il}}{p_{ij}} \right]^{-1}$$

where w_{il} is the national weight for each procedure, w_{ij} is the weight for procedure i in locality j, p_{il} is average allowed charge at the national level for procedure i, and p_{ij} is the average allowed charge in locality j for procedure i.

Given the documented variation across geographic areas in the mix of services provided, an advantage of Fisher's Ideal index is its basis upon the local area's service mix. The Fisher's Ideal index includes all procedures that account for at least 1 percent of total allowed charges in each of several major "types of service" provided by physicians to Medicare beneficiaries, except services provided by anesthesiologists.[31] If a service is not provided in a locality, the weights for the services provided are re-scaled so that they sum to one.

The second index is a stand-alone Laspeyres index. It applies local average allowed charges to a national market basket of procedures. (This market basket differs from the market baskets used in the computation of the Laspeyres component of Fisher's Ideal index above.) Prior research indicates that some geographic areas do not provide the full set of services that

[31]The types of service are those defined by Holahan and Berenson (1991). Appendix B contains a list of the major types of service.

would constitute a nationally representative market basket of Medicare services.[32] That is, in some areas, average allowed charges will not exist for a service that is in a nationally representative market basket. Consequently, the stand-alone Laspeyres index is based upon a set of 68 procedures for which average allowed charges exist in at least 228 localities. The set of procedures is listed in Appendix C. It should be noted that physician visits and consultations represent a disproportionate share of the procedures in the stand-alone Laspeyres index. They account for over 50 percent of total expenditures for the 68 procedures.

Two criteria were used to select procedures for the stand-alone Laspeyres index. The first criterion was to maximize the number of localities that provide all of the services included in the index. The set of services chosen by this criterion alone contains a disproportionate number of evaluation and management services, e.g., physician visits. The second criterion was to include as many types of services as possible. If Medicare allowed charges are not available for all of the services in the index for a given locality, the weights w_{il} for the services for which allowed charges do exist are normalized to sum to one. Consequently, all localities are used in the analysis.

The three broad-based measures provide alternative perspectives on Medicare charge levels. Fisher's Ideal index incorporates the specific market basket of services provided in a locality. Consequently, price variations attributable to area variations in the volume and intensity of services provided influence Fisher's Ideal. The stand-alone Laspeyres index eliminates the influence of volume and intensity variations because it is based upon a fixed set of procedures

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[32]Because of the significant geographic variation in the mix of services provided to Medicare beneficiaries and in average allowed charges, the Laspeyres price index may provide an imprecise approximation to true price levels (Nicholson 1978, pp. 120-122). Zuckerman and Holahan (1991) specifically discuss this issue in the context of measuring Medicare physician prices.

and weights. However, because the Laspeyres market basket is uniform across areas, it is composed of a relatively small and unrepresentative set of procedures. The uniform set of procedures does not reflect the documented variation in services provided across geographic areas. As a consequence, the stand-alone Laspeyres index tends to understate price differences relative to the Fisher's ideal. As noted previously, average allowed charges per RVU eliminate the issues of service mix and intensity by converting services into a common unit of measure. Its potential value is directly related to the validity of the conversion system, in this case, the Resource-Based Relative Value System.

The third approach for measuring Medicare average allowed charge levels uses average allowed charges for specific procedures. The procedures selected are those which account for the greatest proportion of expenditures within each of several major types of service. Appendix D lists those procedures and their type of service. This approach permits an analysis of the model's ability to explain charges for individual procedures. It also permits an assessment of this approach's results relative to the results of models estimated using broad-based indices.

Independent Variables. This analysis includes independent, or explanatory, variables that are theoretically and empirically important in the literature, except measures of substitutes or complements for physicians' services. The following discussion classifies the independent variables as supply factors and physician characteristics, demand factors, general market characteristics, and a Medicare policy variable. The policy variable controls for a historical policy, the overpriced procedure policy.

Supply Factors and Physician Characteristics. The major supply factor is the cost of practice inputs. The measure of input costs is the locality-level Geographic Practice Cost Index

(GPCI).[33] The GPCIs incorporate physicians' time costs, office rents, non-physician labor costs, and malpractice insurance expenses.[34] We use the composite, locality-level indices created by Welch, Zuckerman, and Pope (1989). Based upon economic theory, its expected relationship to physicians' allowed Medicare charges is positive.

The model includes three characteristics of the physician population that the literature often finds to be significantly related to physicians' fees. The first of the physician population characteristics is the locality's specialty distribution. The specific measure of the specialty distribution is the proportion of general and family practitioners. Its expected relationship to physicians' allowed Medicaid charges is negative. This expectation is based upon empirical findings of a positive relationship between physicians' level of training or specialization and their fee for a given service. As less specialized physicians, general and family practitioners are expected to have lower charges.

The second characteristic is physicians' teaching status. Teaching may be associated with higher quality. Consequently, the expected relationship between the percentage of teaching physicians and physicians' average allowed charges is positive. A teaching physician is one with a teaching appointment in a medical school, hospital, nursing school, or other institution of higher learning.

The third and final physician characteristic is the age distribution of physicians in the locality. Its expected relationship to average allowed charge levels is indeterminate. On the one hand, the literature sometimes expects age or experience to be negatively related to fee levels.

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[33]The components of the locality-level GPCIs used in this analysis may be found in HCFA (1991b).

[34]The GPCI used in this study incorporates one-fourth of the variation in physicians' time, as does the Medicare Fee Schedule.

The rationale for this expectation is that older, more experienced physicians are more efficient and, consequently, have lower fees than younger physicians. On the other hand, based on the assumption that greater age and experience are positively associated with quality, the literature sometimes expects a positive relationship between age or experience and fees.

Consumer Demand Factors. The demand variables include those socio-demographic factors commonly identified in the consumer demand literature: income, age distribution, and race. The locality's per capita income is expected to be positively related to fees. The model specifies age and race as a percentage of the population over 64 years old. The age distribution is measured by three variables: the population aged 65-74 years, the population aged 75-84 years, and the population aged over 84 years. The empirical model omits the last age variable. Race is measured by the percentage of whites among the population over 64 years old.

The literature provides a basis for expecting greater demand for health services by the over 64 age group than by younger age groups. However, the expectations with respect to demand for physicians' services within the elderly population are not well established. With respect to race, the empirical literature's results are mixed. Therefore, the expected relationship between physicians' average allowed charges and both age and race is indeterminate.

In addition to these, two other sets of demand factors are included in the model. One set includes factors related to the structure of the locality's health insurance markets. These measures derive from a pricing model in which physicians operate in multiple markets (e.g., Sloan 1982). These measures are the percentage of the population covered by private or other insurance and a measure of physicians' fees in the private insurance market.[35] The private fee

[35]The private insurance category includes the population covered by any insurance except Medicare. The latter category includes those with Medicaid and CHAMPUS coverage.

measure is a weighted sum of physicians' charges to private insurers.[36] The private fee index is normalized, that is, the ratio of a locality's weighted fee level to the national weighted fee level. Based upon Sloan (1982), private fee levels are expected to be positively related to Medicare average allowed charges.

The second set of variables measures consumer information (Pauly and Satterthwaite 1981). In Pauly and Satterthwaite's (1981) model, the sizes of the physician and consumer populations affect the effort required to find a new physician. For example, the model predicts that, as the number of physicians increases, the cost to consumers of acquiring information in their search for a physician also increases. When the search is more difficult, consumers' price sensitivity is lower and, consequently, physicians' equilibrium fees are higher. By similar reasoning, the model predicts an inverse relationship between population size and physicians' fees. As population density increases, lower search costs results in low equilibrium fees. The model's information variables are physicians and population per square mile. Based upon Pauly and Satterthwaite (1981), the expected relationship between physician density and average allowed charges is positive. The expected relationship between population density and average allowed charges is negative.

General Market Characteristics. The empirical model includes two general market characteristics. The first is the supply of physicians, i.e., physicians per capita. The expected relationship between physician supply and average allowed charge levels is indeterminate. Note that this physician supply variable is distinct from the consumer information variable, physicians per square mile. (The correlation between the two is .45.) The second general market

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[36] The private fee index is based upon 84 commonly provided services of various types.

characteristic is a measure of service mix, RVUs per unit of service. Service mix is expected to be positively related to Medicare allowed charges.

The model does not include a variable directly corresponding to the degree to which a locality is rural or urban. The rationale is that other locality level variables, particularly physician and population density, sufficiently control for this locality characteristic.

Medicare Policy Variables. The model includes a historical Medicare policy variable as a potential determinant of Medicare allowed charges. Beginning in 1987, Congress adopted a series of policies that reduced prices for selected procedures so that they would more closely reflect those that might be expected under the Resource-Based Relative Value System fee schedule.[37] The reduction in the charges for these procedures, termed "overpriced procedures," varied depending upon the relationship between a locality's prices and a measure of prevailing national charge levels. Consequently, the overpriced procedure policy may have altered the geographic distribution of prices for the affected services. An important question is the extent to which the policy has affected the geographic variation in physicians' charges.

The model's policy variable is total allowed charges for 1988 or 1990 overpriced procedures as a share of total allowed Medicare charges. It should be noted that this variable does not measure the magnitude of the reductions in Medicare's payments for specific procedures. Instead, it measures the share of Medicaid spending for overpriced procedures. In the results section, we discuss how this variable may be a potential measure of service mix.

The expected relationship between the share of expenditures covered by overpriced procedure reductions and Medicare average allowed charges is indeterminate. On the one hand,

[37]A complete list of overpriced procedures may be found in "Overpriced Procedures," Medicare and Medicaid Guide, vol. 1, paragraph 3267 (Chicago, Illinois: Commerce Clearinghouse, Inc.).

where payments for overpriced procedures have been reduced, measures of Medicare charges may be found to be lower than they would otherwise have been. On the other hand, high payments for the overpriced procedures may indicate areas in which physicians' charges generally tend to be high.

Data Sources

The data for these analyses come from several sources. First is the Health Care Financing Administration's 1990 Part B Medicare Annual Data (BMAD) procedure file. The BMAD data is summarized from all claims for physician services submitted to the Medicare program by or on behalf of its beneficiaries.[38] It is the data source for the measures of Medicare average allowed charges and the overpriced procedure variable. BMAD is also the source for total allowed services used in the computation of RVUs per unit of service. HCFA (1991a) is the source for RVUs. Second is the Bureau of Health Professions' (1991) Area Resource File (ARF). ARF is the source for the remaining consumer and physician characteristics, except those describing health insurance coverage. The county level ARF data is crosswalked to the Medicare locality level.

The third data source is the Current Population Survey (CPS), 1989-1991, the source of data on health insurance coverage.[39] Reliable measures of health insurance are available for MSAs that are represented in the data. The MSA level measures are then crosswalked to Medicare payment localities. Statewide estimates are used if a given MSA is not represented in

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[38]According to the Health Care Financing Administration, 90 percent of beneficiaries received one or more services in 1990.

[39]The analysis is based upon a merger of CPS data from the last half of 1989, all of 1990, and the first half of 1991.

the CPS and for non-MSA areas. A possible measurement problem therefore exists for MSAs that are not represented in the CPS and for non-MSA areas. The use of state level estimates biases the estimated effects of health insurance coverage towards zero. Nevertheless, the composition of an area's health insurance coverage is of sufficient conceptual importance that it is included in the model. Fourth and finally, the Health Insurance Association of America's Prevailing Healthcare Charges System is the source of data on physicians' submitted charges to private insurers. Note that these submitted charges are not analogous to Medicare's allowed charges or payments to physicians.

Model Estimation

The models are estimated using ordinary least squares (OLS).[40] The results reported below are based upon models in which the supply of physicians is exogenous. That is, the physician supply variable is actual physicians per capita. The analysis tests whether physician supply is exogenous. The test's results are also discussed below.

C. RESULTS

The estimated models of broad-based measures of Medicare allowed charges are presented in Table II.3. Table II.4 presents models estimated for individual procedures. The following discusses each set of results. Appendix E reports a correlation matrix for the independent variables.

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[40]Estimation of the models of Medicare allowed charges does not weight observations. This allows localities to contribute equally to the results, rather than allow localities with a large number of Medicare beneficiaries to determine the results.

Table II.3

Estimated Models of Medicare Fees: Broad-Based Measures of Medicare Allowed Charges

INDEPENDENT VARIABLES	LASPEYRES INDEX		FISCHER'S IDEAL INDEX		ALLOWED CHARGE PER RVU	
	Coefficient	p-value[a]	Coefficient	p-value[a]	Coefficient	p-value[a]
Intercept	-1.475*	.064	-.503	.388	-1.649*	.053
Supply Factors & Physician Characteristics						
GPCI	1.581***	.000	1.250***	.000	1.360***	.000
MDOVER65	.225	.165	.281**	.018	.372**	.032
MDGENFAM	-.046	.589	.003	.956	-.056	.536
MDTEACH	.321	.653	.556	.288	1.266*	.099
Consumer Demand						
General Demand Factors[b]						
INCOME	$.002\times10^{-1}$	.945	$.006\times10^{-1}$	.792	-.001	.740
%WHITE	-.053	.473	-.030	.578	-.070	.374
AGE75-84	.804	.485	-.209	.805	1.258	.308
AGE65-74	.689	.295	.175	.717	1.058	.136
Consumer Information						
MD_MILE	.003***	.000	.002***	.001	.001	.178
POP_MILE	$-.003\times10^{-2}$***	.000	$-.002\times10^{-2}$***	.000	$-.001\times10^{-2}$***	.078
Health Insurance						
PRIVATE	-.373***	.001	-.364***	.000	.092	.449
PRIVFEE	.432***	.000	.431***	.000	.235***	.003
General Market Characteristics						
MDSUPPLY	.025**	.012	.013*	.075	.029***	.008
RVUSVC	-.069*	.090	.003	.920	-.151***	.001
OVERPRIC	.537***	.000	.072	.508	.960***	.000
Sample Size	237		237		237	
Adjusted R^2	.739		.809		.646	

Notes:

a. The p-value is the probability that the coefficient's t-statistic will assume a value more extreme than its observed value if the true value of the coefficient is zero.

b. The omitted age variable is the percentage of the elderly who are over 84 years old.

(*)-significant at the .10 level. (**)-significant at the .05 level. (***)-significant at the .01 level.

Table II.4

Estimated Models of Medicare Fees:
Average Allowed Charges for Selected Procedures (a)

Independent Variables	Arthroplasty (b) Coefficient	Coronary Arteray Bypass (b) Coefficient	Fiberoptic Colonscopy (b) Coefficient	Transurethral Resection of Prostrate Coefficient	Cataract Removal (b) Coefficient	CAT Scan of Brain or Head Coefficient	Chest X-ray. Two Views Coefficient
INTERCEPT	-1.095	17.039	1.549	-3.329	-2.112	2.234	-1.244
Supply Factors & Physician Characteristics							
GPCI	0.637	3.819	-0.174	3.150 ***	2.340 ***	-0.156	0.559 **
MDOVER65	0.982	2.704	0.260	1.807 ***	0.018	0.154	0.145
MDGENFAM	0.013	0.172	-0.158	0.089	-0.185	-0.331 *	0.046
MDTEACH	6.578 **	30.884	0.788.	4.221 *	3.101 *	-2.842 *	0.595
Consumer Demand							
General Demand Factors							
INCOME	0.012	0.019	0.000	-0.009	-0.008	0.001	0.005
%WHITE	0.184	0.232	-0.049	-0.172	-0.080	-0.275 *	-0.017
AGE75-84	0.080	-28.840	-2.100	0.477	1.126	-0.594	1.412
AGE65-74	0.446	-20.902	-1.401	-0.200	-0.241	-1.545	0.974
Consumer Information							
MD_MILE	1.67E-03	5.12E-03	7.06E-05	2.96E-04	9.96E-04	1.34E-03	1.64E-03
POP_MILE	-2.00E-05	-1.50E-05	-5.57E-06	-6.57E-06	-9.72E-06	-2.03E-05	-1.76E-05 **
Health Insurance Coverage							
PRIVATE	-0.236	3.195	0.129	1.045 ***	0.366	-0.863 ***	-0.108
PRIVATE FEE	0.809 **	-0.9967	0.996 ***	0.273	0.307	0.735 ***	0.567 ***
Genereal Market Characteristics							
MDSUPPLY	-0.031	-0.333	-0.014	0.018	0.005	0.027	0.001
RVUSVC	-0.127	0.181	0.038	-0.424 ***	-0.405 ***	0.034	0.142 ***
OVERPRIC	0.822	-2.065	0.188	2.268 ***	3.080 ***	0.423	-0.402 **
Sample Size	223	170	237	237	237	237	237
Adjusted R-square	0.120	0.000	0.397	0.331	0.382	0.231	0.479

Table II.4 (cont.)

Estimated Models of Medicare Fees:
Average Allowed Charges for Selected Procedures (a)

Independent Variables	Medical Office Visit Coefficient	Hospital Visit Coefficient	SNF/ICF Visit Coefficient	Emergency Visit Coefficient	Initial Consultation Coefficient	Ophthalmological Exam Coefficient	Echocardiography Coefficient	Heart Catherization Coefficient
INTERCEPT	-3.483 ***	-3.906 ***	-0.595	3.329	-0.327	2.288	1.609	-2.012
Supply Factors & Physician Characteristics								
GPCI	1.986 ***	2.016 ***	1.378 ***	3.251 ***	1.030 ***	2.373 ***	-0.656	2.029 ***
MDOVER65	0.502 **	0.409	0.714 *	0.751	0.080	0.600 *	0.653	1.488 **
MDGENFAM	-0.027	0.131	-0.598 ***	0.309	0.065	0.093	-0.430	-0.391
MDTEACH	0.125	-0.049	-1.545	0.411	-0.451	-0.328	-3.313	3.540
Consumer Demand								
General Demand Factors								
INCOME	0.004	-0.006	-0.000	-0.013	0.007	0.006	-0.013	-0.014
%WHITE	0.067	-0.183	-0.025	-0.453 *	-0.008	-0.499 ***	0.293	-0.175
AGE75-84	2.827	3.716 *	-0.626	-7.833 *	-0.286	-4.402 **	-2.959	-0.344
AGE65-74	1.901 *	2.362 **	0.732	-3.970 *	-0.056	-2.856 **	-0.219	0.771
Consumer Information								
MD_MILE	5.12E-03 ***	5.25E-03 *	2.07E-03	5.03E-03	2.50E-03 **	4.71E-03 ***	2.32E-04	1.86E-03
POP_MILE	-4.68E-05 ***	-4.69E-05 *	-1.48E-05	-6.06E-05 **	-2.64E-05 ***	-4.92E-05 ***	-1.60E-05	-1.95E-05
Health Insurance Coverage								
PRIVATE	-0.229	-0.205	-0.588 **	-0.451	-0.475 ***	-1.207 ***	-0.169	0.190
PRIVATE FEE	0.367 ***	0.530 ***	0.255	-0.079	0.488 ***	0.315 *	0.916 ***	0.623
Genereal Market Characteristics								
MDSUPPLY	0.062 ***	0.057 ***	0.002	0.022	0.006	0.020	0.138 ***	0.060
RVUSVC	-0.081	0.031	0.159	0.125	0.215 ***	-0.026	-0.013	-0.559 ***
OVERPRIC	0.221	0.039	0.195	-0.068	-0.507 **	0.695 **	-0.220	2.414 ***
Sample Size	237	236	237	237	237	237	236	236
Adjusted R-square	0.646	0.546	0.391	0.257	0.548	0.595	0.164	0.192

Notes:
(a) Appendix C lists the 1990 HCPCS code for each of these procedures.
(b) This is an overpriced procedure.
(*) statistically significant at the .10 level.
(**) statistically significant at the .05 level.
(***) statistically significant at the .01 level.

Broad-Based Measures of Medicare Allowed Charges

The columns of Table II.3 correspond to the three broad-based measures of allowed charges: the stand-alone Laspeyres index, Fisher's Ideal index, and allowed charges per RVU. In general, the results are consistent with expectations based upon theory and upon previous empirical analyses. For example, on the supply side, input costs are significantly and positively related to Medicare charges. On the demand side, consumer information variables are found to be significantly related to Medicare charges. The results are discussed below in greater detail.

Supply Factors and Physician Characteristics. The major supply factor included in the models of Medicare allowed charges is the cost of inputs, measured by the GPCI. The GPCI is positively and significantly related to the allowed charge measures. That the GPCI's coefficient is greater than 1 in all three models indicates that Medicare allowed charges vary more than input costs vary. It is interesting to note that the GPCI alone can explain 50 percent to 70 percent of the variation in these three measures of Medicare allowed charge levels.

Estimated elasticities provide some sense of the relative magnitude of the relationship between the GPCI and average allowed charges. A one percent increase in the GPCI is associated with a 1.2% increase in Fischer's Ideal index. In contrast, a one percent increase in the private fee index is associated with a .42% increase in Fisher's Ideal. The estimated elasticity of physician supply is .02.

The signs of the variables that characterize the physician population are generally consistent across models, though often statistically insignificant. The percentage of teaching physicians is positively related to Medicare charges and, with one exception, the percentage of general and family practitioners is negatively related. The percentage of physicians over 65 years is positive and is statistically significant at traditional levels in two models.

Consumer Demand Factors. The relationship between the general demand factors (age, race, and income) and the measures of Medicare allowed charges is statistically insignificant in this analysis. However, the consumer information and health insurance variables are found to be important determinants of Medicare allowed charges for physician services. With respect to the consumer information variables, as predicted by Pauly and Satterthwaite (1981), the estimated relationship between physician density (i.e., physicians per square mile) and Medicare allowed charges is positive and the relationship between population density (i.e., population pe square mile) and charges is negative. These relationships are statistically significant.

With respect to the health insurance variables, the relationship between physicians' Medicare allowed charges and physicians' charges to private insurers is positive and statistically significant. In addition, the relationship between physicians' Medicare allowed charges and the proportion of a locality's population with private insurance is negative and statistically significant. That is, controlling for all other factors, when the relatively more generous private insurance market is small, physicians' charges to Medicare are higher than they would otherwise be.

Medicare Policy Variable. The results indicate a positive relationship between Medicare average allowed charge levels and the percentage of total allowed charges for overpriced procedures. The relationship is statistically significant in two of the three models. The positive relationship may reflect one of or both of two cases. First, high charges for these selected, high volume procedures may reflect a general pattern in a given locality of charging high fees relative to the resources required to provide services. In this case, the expected relationship between total allowed charges for overpriced procedures and Medicare average allowed charges would be positive. Second, the percentage of total allowed charges for overpriced procedures may be

serving as a measure of service mix. As such, it may be reflecting dimensions of service mix not captured by the designated service mix measure, RVUs per unit of service.[42]

General Market Characteristics. The model includes two general market characteristics, physician supply and service mix. Exogenous physician supply was found to have a positive and statistically significant relationship to fee levels.

A Hausman (1978) test was unable to reject the null hypothesis that physician supply is exogenous. The test compared the physician supply coefficient for the model reported here with the coefficient for a model in which supply was endogenous. The model with endogenous supply was a two-stage model. The first stage estimated a model of physician supply in which the independent variables were per capita income, physician characteristics, the private fee index, population density, and a set of variables describing the attractiveness of the locality. The location attractiveness variables were population growth rate, population, hotel receipts per capita, mean January temperature, and direct general expenditures per capita (Pauly and Satterthwaite 1981 and Cromwell and Mitchell 1986). The independent variables in the second stage excluded the location attractiveness variables and included all categories shown in Table II.2. The measure of physician supply was predicted from the first-stage model.

In the two models in which it was statistically significant, the service mix measure was negatively related to fees rather than positively as expected. This result indicates that the charge per RVU is lower in areas that tend to provide high-RVU services than in areas that provide low

[42]The correlation between RVUs per unit of service and the percentage of total allowed charges attributable to overpriced procedures is 0.46.

RVU services.[43] The significance of the service mix variable apparently is related to whether the fee measure already accounts for the mix of service provided in the locality. For example, the Laspeyres index is based upon a fixed market basket. Correspondingly, the service mix variable is statistically significant. On the other hand, the Fisher's Ideal index incorporates a locality's service mix. Consequently, the service mix variable is not significant in the corresponding model. This same pattern of significance holds for the percentage of Medicare allowed charges attributable to overpriced procedures. This pattern is consistent with the previous assertion that charges for overpriced procedures may be serving as a measure of a locality's service mix.

Average Allowed Charges for Individual Procedures

This section discusses the estimation results for models in which the dependent variable is average allowed charges for individual procedures. The procedures represent fifteen types of services provided by physicians and include five overpriced procedures.[44] Charges are normalized. The normalized charge is the ratio of a locality's average allowed charge to the national average allowed charge.

The estimation results vary across procedures. For example, the model explains virtually none of the geographic variation in the average allowed charge for coronary artery bypass, but nearly 65 percent of the variation in the average allowed charge for a medical office visit. The

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[43]It may also be relevant that the Medicare fee schedule's Resource-based Relative Value Scale assigns greater value to management and evaluation services (such as office visits and consultations) and less value to more specialized services (such as surgical procedures) than was implicit prior to the implementation of the fee schedule. Consequently, the structure of the RVU system may itself contribute to the observed negative relationship between case mix and Medicare fee levels.

[44]Appendix D lists the individual procedures and identifies those classified as overpriced.

service mix measure, RVUs per unit of service (RVUSVC), is significant and positive in the equation for an initial consultation, but negative and significant in the equation for heart catheterization. The GPCI is insignificant in the models for some procedures (e.g., coronary artery bypass and echocardiography).

Three factors may contribute to the variation in results observed across procedures.[45] First, not all physicians provide all of the services for which equations are estimated. Ophthalmology, for example, is the only specialty that removes cataracts or provides ophthalmological examinations and evaluations. Consequently, the independent variables based upon the total population of physicians (e.g., the supply of physicians or their specialty distribution) would not be expected to be significant in the models for these procedures. These errors in variables probably bias the associated coefficients toward zero. On the other hand, almost all specialties provide medical office visits. This may explain the generally better performance of models for procedures that are provided by a wide range of specialties compared to procedures provided by only one or two specialties. In this context, better performance corresponds to higher explanatory power (measured by the adjusted R^2 value) and consistency with the results from the broad-based models of physician fee levels.

Second, some of these procedures are almost exclusively provided to the Medicare population. Transurethral resection of the prostate and cataract removal, for example, are

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[45]One reviewer has suggested that differential application of the Medicare Economic Index (MEI) to new versus existing procedures accounts for the varying explanatory power of the models across procedures. The argument that allowed charges for procedures that were new technologies in the 1980's display greater variation than other procedures is based upon two considerations. The first is that charges for new services generally tend to exhibit a high level of variability across geographic areas. The second is that cumulative MEI updates were not applied uniformly across procedures during the past decade. Consequently the prevailing charge screens for these "newer" services would be more variable than the screens established for "established" services such as medical office visits. Therefore, average allowed charges (after application of prevailing charge screens) would be more variable than otherwise. The current analysis is unable to test this hypothesis.

infrequently performed on non-Medicare patients. Consequently, measures of health insurance coverage, such as the percentage of the population that is privately insured, may not be appropriate for models of these procedures.

Third, in general, variation in the results for specific procedures may also be attributable to geographic variation in the provision of services. For example, highly sophisticated or new services simply may not be provided in every locality. Consequently, the resulting sample used for estimation is probably biased by exclusion of small or predominantly rural localities.[46] Coronary artery bypass, for example, is provided in 170 of the possible 237 localities. (Note that this is the worst performing of the equations for specific procedures.) The extent of occurrence of this problem in Medicare data is determined by the configuration of the localities.

Although the results vary across procedures, two observations can be made. First, the results for a medical office visit closely parallel the results from the models of broad-based measures of Medicare charges. The results are parallel with respect to the signs and often significance of the independent variables. This has implications for previous literature in which the measure of physician fees is the price of an office visit. The implication is that the price of an office visit may be a reasonable (but not perfect) proxy for a broad-based index of physician payment levels, better than many other services provided by physicians, including hospital visits.[47] These results also imply that the appropriate specification of models for other, and

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[46]This may suggest the need to correct for selection bias in the estimation of models of Medicare charges for individual procedures that are not provided in every pricing location. Neither this nor other analyses of physician fees for such procedures in the literature has corrected for selection.

[47]This is not to suggest that either the payment for an office visit or a broad-based index addresses the appropriateness of the relative payments for services. Recall that an important objective of the Medicare fee schedule was to change the relative payments of services.

more specialized, procedures needs to be carefully considered. For example, the physician supply variable may need to reflect the supply of specialists who provide a given service.

Second, some patterns are evident across the models for individual procedures. Many variables are of the sign estimated in the models for broad-based measures of physicians charges, and even more often have the same estimated sign if the coefficient is statistically significant. For example, the measure of physicians' practice costs (GPCI) is positive in all equations except two, and is significant in approximately 70 percent of the cases. Similarly, the coefficients for private fee levels are generally positive, and are always positive when statistically significant. The consistency of results across models of Medicare charges for specific procedures and broad-based measures of Medicare charges indicates that the model and its results are fairly robust.

D. IMPLICATIONS

This analysis initially posed two questions. The first question was whether factors other than practice costs were systematically related to the variation observed in Medicare's payments to physicians prior to the implementation of the Medicare fee schedule. If such factors existed, the second question was whether they should be used, in addition to the GPCI, as fee schedule adjustors.

The answer to the first question is, yes. From among potential factors from the literature on physician pricing, the empirical analysis finds several to be systematically and significantly related to broad-based measures of Medicare average allowed charges. The significant variables include input costs associated with a physician's practice, consumer demand factors, and general market characteristics. The consumer demand factors found to be significantly related to

Medicare average allowed charges are physician and population density and health insurance coverage. The significant market characteristics are physician supply and service mix.

The results varied for individual procedures' Medicare fees. For example, input costs are not significantly related to fees for some procedures. The text discussed possible explanations for the variable ability of the empirical model to explain geographic variation in average allowed charges. However, better understanding of these results will require additional research.

One potential limitation of the analysis should be noted at this point. The empirical model is based primarily upon the literature on physician pricing in private markets. Although the results suggest that many of the factors that determine private prices are also related to Medicare's physician payments, an alternative framework might help identify additional factors. Such a theoretical framework does not yet exist in the literature.

None of the factors identified as being significantly related to Medicare payment levels appear to be obvious candidates for adjusting payments under the Medicare fee schedule. However, the question of whether any of the significant factors should be used as adjustors for the Medicare fee schedule requires consideration of factors in addition to statistical significance. In some cases, whether Medicare should adjust its fee schedule for factors significantly related to prior payment variations may be obvious to decision-makers. More often, however, whether Medicare fee schedule payments should by adjusted by any of the statistically significant factors would probably involve policy considerations. For example, policy makers could be disinclined to increase fee schedule payments in proportion to an area's supply of physicians or the proportion of total Medicare spending for overpriced procedures. The latter case would specifically contradict prior Medicare policy.

In addition, whether Medicare fee schedule payments should by adjusted by any of the statistically significant factors also depends upon the purposes of such an adjustment. Fees might be adjusted in order to account for factors believed to influence the cost of practice. Characteristics of an area's Medicare population might fall in this category. Payments might also be adjusted to reduce possible problems in Medicare beneficiaries' access to care. Access problems might occur in areas where payments under the Medicare fee schedule are expected to be significantly lower than they were prior to the implementation of the fee schedule. Congress appears to express concern about such potential access problems in the mandate to study factors which may explain geographic variation in Medicare's payments to physicians. This chapter's analysis helps identify factors that might be associated with relatively high payments prior to the fee schedule's implementation. These factors may be associated with potential access problems. This analysis, however, does not necessarily or directly identify factors or conditions associated with potential access problems. Chapter IV more directly analyzes characteristics of Medicare payment localities that may be associated with access problems.

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III. ASSESSMENT OF THE ACCURACY OF THE OVERHEAD GPCI[1]

This analysis assesses how accurately the Overhead Geographic Practice Cost Index (OGPCI) measures actual practice cost variation. The OGPCI is constructed to capture differentials in the prices physicians face for non-physician personnel and office rent.[2] A major reason for undertaking this assessment is that the OGPCI was based on proxy input price data. While these data can be expected to vary geographically in much the same way as actual input prices faced by physicians, they are not derived from these actual prices. Even though analysis contained in the 1991 PPRC Annual Report indicates that the proxy data used do seem to track well with other sources of proxy data, the issue of how well any of the available input price data tracks actual expenses remains open. To our knowledge, the only effort to compare the OGPCI with actual expenses was conducted by the American Medical Association. Gillis et al. (1991) found that the OGPCI explained a reasonable proportion of the variation in both office and non-physician personnel expenses per unit of input.

Another potential motivation for exploring the accuracy of the OGPCI is that it measures geographic differentials in input prices and, as such, may not track geographic differences in total physician practice expenses very well. However, if differences in total expenses are related to practice inefficiencies that were within physicians' control to eliminate, there would be little justification to be concerned that they were not captured by the OGPCI. Moreover, total

[1]This chapter was written by Stephen Zuckerman.

[2]The index, in principle, could also capture differences in the price of medical equipment, medical supplies, and other practice expenses (excluding malpractice insurance). However, because of data constraints and the plausible assumption that these inputs are largely purchased in national markets, variations in these prices are not reflected in the current OGPCI.

expenses may vary due to variations in service volume.[3] Since the OGPCI is used as an adjuster of the price paid for each unit of service, it is not necessary for the OGPCI to reflect differences due to service volume. A study that tried to explain variations in total expenses would have to focus on both differences in service volume and input prices, as well as other factors. Because our objective is to assess the OGPCI, we do not address this broader and more complex issue related to total expenses.

We extend the work of the AMA by analyzing more recent data on practice expenses and by examining a wider range of input price proxies than were used in the OGPCI adopted for use in the Medicare Fee Schedule (MFS). Our analysis differs from the AMA work in that we do not consider the ability of the work and malpractice GPCIs to explain geographic differences in their respective elements of practice revenues, i.e., net income or malpractice expenses. Our goal is to address the following four questions:

1. Is there geographic variation in expenses per unit of input?
2. How well do the <u>current</u> GPCIs explain variation in expenses?
3. Are there potential alternative GPCIs that better explain expenses?
4. Could any of the available indices be used as an adjuster for "equipment, supplies, and other expenses," whose costs are assumed not to vary across areas?

In the section that follows, we review the data sources that can be used to measure practice expenses and to derive alternative price proxies for the components of the OGPCI (i.e., office rents, non-physician employee wages, medical equipment, medical supplies, and "other"

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[3]For example, rural physicians have suggested that their relative isolation forces them to purchase more equipment or employ more staff than their urban counterparts and, therefore, have higher total expenses. However, survey data show that their total expenses are, on average, not greater than urban physicians and that their visit volume is higher (Gonzalez, 1991).

expenses). Section B describes the empirical analyses required to address the main study questions. The results are discussed in Section C. We conclude this section of the report with a general assessment of the current OGPCIs and consider the desirability of employing any of the alternative data.

A. REVIEW OF DATA SOURCES

Practice Expense Data

The data source to measure actual practice expenses needs to satisfy several criteria. First, it has to provide information on actual physician expenses for each of the categories of inputs included in the OGPCI. Even though the OGPCI assumes that input prices for equipment, supplies, and "other" expenses do not vary across areas, having these data allows for tests of the credibility of this assumption. Moreover, having these data makes it possible to develop some type of geographic adjuster if one is needed for these inputs. Second, the data base should contain some measure of input quantity that would allow an analysis of expenses that controls for geographic variation in input use. In a sense, expenses per unit of input can be thought of as an approximate measure of input price. Third, there should be information on a variety of factors that may explain expense differences across physicians that are not related to geographic areas, e.g., specialty, group practice size, and years of experience.

The two most widely used potential data sources are the HCFA Physician Practice Costs and Income Survey (PPCIS) and the AMA Socioeconomic Monitoring System (SMS). Both of these are surveys of physicians. PPCIS tends to be fielded once every 3-5 years, most recently in 1988. Details relating to the survey methodologies used in PPCIS and SMS can be found in Thalji et al. (1991) and Gonzalez (1991, p.165), respectively. The SMS is fielded in the spring

of each year and, in 1990 and 1991, added several special questions designed to collect data on input quantities. AMA agreed to make extracts from both of these data bases available to the Urban Institute for the purpose of conducting this study. Having data from two years of SMS surveys provides a larger sample size and a more detailed geographic analysis than would be available from PPCIS. We would be allowed to provide summary statistics from these data to HCFA, but would not be able to disclose data for individual physician observations.

In terms of the criteria laid out above both PPCIS and SMS are quite similar. The main difference regarding their approaches to collecting expense data is that PPCIS collects data for the entire practice and derives "per physician" by dividing practice totals by the numbers of physicians while AMA asks the physician to report his/her share of the practice's expenses. Dayhoff and Cromwell (1991) suggest that this may be a factor in explaining why office expenses, both in absolute terms and as a share of total costs per physician, are higher in the AMA data than in the PPCIS data. In addition, they show that the SMS data are skewed toward higher values of office expenses. They hypothesize that some AMA respondents actually may be reporting office expenses for the entire practice. However, they present little evidence to suggest that responses to other expense questions are being affected in the same way.

Another reason that mean SMS office expenses exceed PPCIS may be because the SMS question is not limited to rent, utilities, and telephone in the same way as PPCIS. PPCIS asks only about these three categories of office expenses, whereas SMS asks for all "office expenses." The SMS survey may be capturing expenses for items such as furniture, computers (hardware and software), and cleaning and maintenance. The Dayhoff and Cromwell study cites this issue and it is quite likely a reasonable explanation for some of the difference that is observed.

In choosing between PPCIS and SMS as a source of data on practice expenses, the decision seems to rest on whether the focus of the analysis is the practice or the physician. If it is the practice, then PPCIS is the only choice. If it is to be the physician, either SMS or PPCIS could be used. Since this analysis is part of an assessment of how well the OGPCI reflects variations in actual expenses, it would be reasonable to focus on the expenses of the entity being compensated under the MFS. Fundamentally, this is the physician who provides the individual services. Given this goal, one needs to consider how well the PPCIS procedure for allocating practice-level expenses to the individual physician actually performs.

The PPCIS approach assumes that expenses are shared equally across all physicians in a group. The total number of physicians is defined as the number of full-time physicians plus one-third of the part-time physicians. Even when restricted to full and part owners of their practices, the result is a lower mean office expense per physician from PPCIS than from SMS. This may be the result of assuming that part-time physicians actually bear one-third of the expenses of full-time physicians, i.e., overstating the denominator in the PPCIS derivation of expenses per physician. In addition, conversations with researchers at the Center of Health Economics Research indicate that removing imputed values used to fill in missing PPCIS data would reduce the gap of $14,000 between PPCIS and SMS mean office expenses by approximately 25 percent.

Moreover, the imposition of an equal expense sharing assumption within the PPCIS medical groups when it may not be true will necessarily reduce the numbers of physicians that are observed to "incur" high office expenses. By allowing for physicians to report expenses based on the actual method of expense sharing used in groups, SMS may be capturing expenses for those physicians who bear a disproportionately greater share of their groups' expenses. This would explain, in part, why SMS appears to be skewed toward higher values of office expenses.

It might be instructive to use both PPCIS and SMS in a study of this type to determine how the different survey methodologies might be affecting the findings. However, given the available resources some choice is necessary. Overall, it appears that if the goal is an analysis of physician-level expenses then SMS--designed to collect data at this level--is a more credible source. In addition, SMS data are currently being used as the basis for the weights in the GPCI and to determine the relative values for overhead and malpractice in the MFS, suggesting that they have a high degree of acceptability among decisionmakers at HCFA.

Input Price Proxies

Reviews of data sources that contain potential price proxies for office rents and employee wages are presented in Zuckerman, Welch, and Pope (1987), McMenamin (1990), and Dayhoff and Pope (1990). The findings from these studies are discussed below in order to identify credible alternatives to the set of proxies used in the present OGPCI. In the present OGPCI, differences in office rents is measured with an index of apartment rents based on the HUD fair market rents and differences in employee wages with an index of wages for selected occupations based on the 1980 Census. To date, no studies have identified proxies that could be used to capture the present extent of geographic variation that exists in equipment, supply, or "other" prices. As such, the OGPCI assumes that these inputs are purchased in a "national" market and exhibit no geographic variation.

Office Rents. Although there are no data sources that can be used to measure geographic differences in the price paid for physician office space, there are three basic categories of proxies that have been identified. The first is other commercial office rents. Usually data on these rents are compiled by real estate trade associations. Examples of these sources are the Building

Owners and Management Association (BOMA), Institute for Real Estate Management (IREM), Office Network, and Society of Industrial and Office Realtors (SIOR). The SIOR information was used by Schmitz (1991) in his review (for the College of Physicians and Surgeons of Columbia University) of the OGPCI value for Manhattan.

The basic drawbacks of using these data in the OGPCI are that they only provide data in a limited number of urban areas and, even in these areas, are not necessarily representative of commercial rents. However, Dayhoff and Pope (1990) used the BOMA and Office Network data in a study conducted for PPRC and concluded that, for the areas from which data were available, both sources were "moderately highly correlated" with the HUD fair market rents. The limitation of these data is highlighted by the fact that the broadest assessment they could carry out involved a comparison of rents across only 61 cities and no rural areas. One finding from this study that is noteworthy and might provide justification for developing a more complete and representative set of data on commercial rents is that office rents were more variable across areas than apartment rents.

This leads directly to the second category of price proxies that is available -- apartment rents. Given the inadequacies of the commercial rent data this is the type of proxy data that was used in the OGPCI. The basic justification for using apartment rents as a proxy for office rents is that the spatial economic factors that affect apartment rents (e.g., population density and local economic conditions) should affect commercial rents similarly. The major criticism of this proxy is that this assumption lacks face validity. The suggestion is that an index based on commercial rents would vary quite differently than one based on apartment rents. As discussed above, analyses conducted for PPRC suggest that the index based on apartment rents is reasonable but may vary less than one based on commercial rents.

Consistently defined apartment rent data are available for geographic areas as small as a county. McMenamin (1990) suggests median gross rents for renter-occupied units, available at the county-level, as the basis for an office rent index. However, this does not control for differences in unit size across areas. As an alternative, the OGPCI uses the HUD fair markets rents (FMR) that are updated and published annually in the Federal Register. These rents measure the 45th percentile of rents in each geographic area for housing units of various sizes and are available for all MSAs and rural counties. FMRs are derived from the decennial Census and the annual American Housing Surveys and are updated each year using the CPI for rent and utilities.

At the time the current OGPCI was derived, the most recent FMRs that were available reflected rental patterns as of 1987. Now, FMRs covering each year through 1991 are available and could be used as an alternative or in conjunction with the current index. To the extent that 1987 rents do not reflect patterns in 1992, basing the index on more recent data may be desirable. Moreover, relying on data from any single year may introduce anomalies into the OGPCI due to both real and random fluctuations in particular areas relative to longer-term differentials. For example, a severe but short economic downturn in a particular area could cause slow growth or reductions in its CPI for rents and utilities, leading to a relative reduction in its FMR. Comparisons between the interim rental index based on 1986 data (Zuckerman et al., 1987) and the rental index used in the MFS based on 1987 data (Welch et al., 1989) suggest that year-to-year fluctuations in the relative FMRs do occur. This suggests that an index based on several years of FMR data could be a useful alternative to the present single-year approach.

The final category of office rent proxies that is available would treat physician office expenses in a manner analogous to hospital capital costs. Since both are physical inputs used in

the production of medical services, the comparison may be appropriate. Several options for making geographic adjustments in payments for hospital capital costs under PPS have been proposed. One index was developed that compared the cost per square foot of institutional construction (e.g., schools, government buildings, and hospitals) among MSAs and non-MSA portions of states (Federal Register, May 19,1987). This index used data from the Dodge Construction Potentials database assembled by Data Resources, Inc. Because this index did not control for differences in the types of buildings across areas, Pope, Hurdle and Posner (1989) suggested several alternative indices. These included one that adjusted for differences in building types and three that were based on variation in construction input prices (i.e., labor and materials).

Despite the improved plausibility of the input price indices relative to the construction cost index, HCFA chose to base the capital payment adjustment on the Wage Index that was already being used in PPS (discussed below). To the extent that office rent differences can be captured with a construction input price index, any of the indices developed by Pope et al. or HCFA might be viable alternatives to the HUD fair markets rents. However, because indices that focus only on construction costs ignore operating expenses associated with building management and upkeep as well as local market conditions that affect demand for office space, we believe that a rental index is superior to a construction cost index for use in the OGPCI.

As this discussion indicates, the nature of the data available for use in the OGPCI is not that different now than when the original data review was undertaken in 1987. The one thing that has changed is the level of interest that now exists in pursuing an index based on a commercial rent proxy. PPRC and a number of physician groups providing comments on the Proposed Rule for the Fee Schedule have implied that such an index would have greater face

validity, i.e., that commercial rents are a closer proxy for physician office rents than are apartment rents. In fact, there appears to be some interest in considering an index that might reflect rental variations within MSAs. However, alternatives to the HUD price proxies can only be developed within the constraints of available data. PPRC (1991) suggests that developing a new source of data on commercial rents should be considered.

Until a new source of commercial office rent data that reflects both urban and rural areas exists, a credible index based on commercial rents cannot be developed. An index that relied on actual data in all areas could not be derived from the current sources (e.g., BOMA or SOIR) that provide the most complete and representative geographic coverage. It would be necessary to impute rental rates in areas for which actual data are not provided. These missing rates could be imputed with models that treat rents as a function of population size, population density, area wages, and other relevant variables that are available in all areas. A weakness of this approach is that it would impute values for types of areas that are not represented in the original data. Most prominent among these are small MSAs and rural areas. Even if the imputed values seemed plausible, the lingering policy question as to whether an index not based on actual data should be used in the MFS would remain. Given these limitations in the commercial office rent data, refinements based on the available FMRs seem to be the most feasible course of action.[4]

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[4]Following Schmitz (1991), it might be possible to use some of the office rent data to allow the MSA-based FMRs to vary across localities within multi- locality MSAs. This could improve the face validity of the OGPCI in the Manhattan locality of New York or in some of the localities in Los Angeles. Of course, increases in Manhattan would necessarily mean decreases in other localities in the New York MSA or in other areas in order to maintain budget neutrality. Moreover, using the Schmitz approach (i.e., assuming that the FMR index value for the entire New York MSA is the same as one that would have been based on office rent data), involves assumptions that could be hard to defend in areas for which office rents are not available or in which the downtown is not identified as its own locality. However, in the interest of equity and the goal of having the OGPCI track costs at the locality level, some recognition of cost differences within multi-locality MSAs may be considered in future methodological refinements of the OGPCI. It is beyond the scope of the present project because it requires a fundamental change in the way the rental index is computed that should be applied comprehensively in all appropriate MSAs. Making a change in only one area to correct a "Manhattan problem" would not be desirable.

Employee Wages. Both the McMenamin (1990) and Zuckerman et al. (1987) studies identify two types of data that provide broad geographic coverage and could be suggested as alternatives to the 1980 Census price proxies for employee wages. The first is establishment-level data that provides statistics on annual wages per employee. Specifically, these data are contained in the ES-202 series -- collected by the Bureau of Labor Statistics from reports by employers to state unemployment insurance funds -- and in FICA data published in County Business Patterns. The main drawbacks with these sources are that they do not distinguish between full- and part-time employees and, for some firm classifications, seem to include payments made to physicians in the form of salary. Despite these limitations, McMenamin uses the County Business Patterns data for the Health Services Industry (SIC 80) as the employee wage proxy in his "benchmark" index.

The second alternative for an employee wage proxy is the Hospital Wage Index used to compute PPS payment rates. This index is based on a HCFA survey of hospital wage and salary data for all hospitals paid under PPS. For each MSA and rural area of a state, the index compares the area's average hourly wage to the national average hourly wage of all hospital employees. The data being used presently in the index reflects wages paid in 1988. Many rural hospitals and their counties have challenged the validity of this index, claiming that they are actually in the same labor market area as some urban hospitals and should have a wage index that reflected this. As a result, many otherwise rural counties have been reclassified as urban for the purposes of computing their hospitals' payments. In part, these rural adjustments have been required because of the fairly large "cliffs" in the index at the borders between many MSAs and rural areas.

However, because of the blending of urban and rural areas in many of the physician payment localities, there would be fewer instances of border problems if the PPS Wage Index were used in the OGPCI. This does not mean that there is a strong conceptual basis for adopting the PPS Wage Index as the price proxy for employee wages. As noted in Zuckerman et al. (1987), there are substantial differences in the occupational mix of workers employed by hospitals and those employed in physicians' offices. Data show that almost two-thirds of employee salaries are paid to secretaries and administrative staff in physicians' offices, where only about 12 percent of hospital labor costs are for these categories of workers. Even though the PPS wage index was fairly highly correlated with available wage data for clerical workers, the correlation coefficient was not so close to one so as to suggest that the occupation mix differences could easily be ignored.

One possible reason that the PPS Index is more variable is that it is based solely on the area's hospital labor force. As a result, it is based on fewer workers (adding to sampling variability) and may reflect specific features of the hospital labor market (e.g., a hospital in a monopolistic position or a unionized labor force) that may not be relevant to physicians' practices.

As in the case of office rents, there have not been many changes in the kinds of data that are available to be used as a price proxy for employee wages. While the Census data is conceptually superior to other alternatives, the fact that it is based on data from 1980 is a drawback. As the 1990 Census data become available updating will be possible. However, relying on an index derived solely from Census data will necessarily involve infrequent updating.

Medical Equipment, Supplies, and "Other" Expenses. The OGPCI used in the Medicare Fee Schedule is computed under the assumption the input prices for equipment, supply

and "other" inputs used by physicians exhibit no geographic variation. While this appeared to be a reasonable assumption relative to the observable variation in office rents and employee wages, there were no data available to test this assertion. Given the objective of validating all aspects of the OGPCI, we have undertaken a thorough re-examination of potential sources of price or price proxy data for these inputs.

Our focus is on the categories of medical equipment and medical supplies. It remains the case that the extremely heterogeneous nature of "other" expenses makes it difficult to match with a single price proxy. Expenses that might be captured in this category include automobile, accounting, office supplies, furniture, and cleaning services. Moreover, this variety of expenses, with little knowledge about the relative importance of each, makes developing a geographic index of "other" input prices a highly subjective process.

Our basic approach to searching for input price data on equipment and supplies was fairly straightforward. We started by contacting very general potential sources of information and then moved toward more specific sources. For information on equipment prices we contacted the National Association of Medical Equipment (NAME) and Health Industry Manufacturers Association (HIMA). HIMA is the trade association representing major producers of medical equipment. They indicated that they researched the issue of geographic variability in equipment prices, but were unwilling to be specific or release any information because the data is proprietary. NAME, representing home health and rehabilitation equipment suppliers, claimed that they did not track prices in different geographic areas.

The Bureau of the Census also distributes some data on medical equipment expenditures and quantities through its Current Industrial Reports series. These data are presented as a time-series but are not disaggregated by any geographic breakdowns. As such, these reports are not a

useful source of information for refining the OGPCI. However, they might have some role for a different HCFA application such as in estimating the rate of increase in equipment prices in the MEI.

Given this lack of a unified source of information on equipment prices, we decided to contact several equipment producers to determine their policies toward pricing in different geographic areas. To identify the appropriate firms, we relied on information from the Medical Device Registry and the Health Industry Buyers Guide. Producers were listed in these publications according to the types of equipment they manufacture. We contacted General Electric and Fischer Imaging Corporation regarding prices for diagnostic imaging equipment as well as Eastman Kodak and Pharmacia Diagnostics about blood testing machines. While these companies indicated that not all physicians would pay the same price for a given piece of equipment, they did not indicate that the geographic location of the physician was a factor in determining equipment prices. Not surprisingly, they indicated that practices installing more units of a given piece of equipment or needing to replace each piece more frequently due to heavy use would pay lower prices per unit.

Some data on variations in medical supply prices may exist. The national trade association for supply firms--Health Industry Distributive Association (HIDA)--suggested that companies that provide marketing services to medical supply companies might know something about geographic variation in these prices. One such firm--IMS America--would be able to supply data on geographic variation in many specific medical supply prices.

However, there are drawbacks to these data. First, they are based on a survey of hospitals, not the actual supply firms. Hospitals are asked about the prices they pay, so that some of the observed geographic variation may reflect differences in hospital size and volume.

Second, IMS bases any of its analyses on a sample of only 350 facilities. As such, they indicate that the most detailed level of geographic disaggregation of these price data is the Census Division. Third, they could provide data for 1000 individual supply items (e.g., tongue depressors or bandages), but have no approach for aggregating this information into an index of prices for a market basket of supplies. In fact, creating an index of various supply prices might involve data on the distribution of supply expenses that are not available.

Even in the face of these limitations, it appears that these IMS data offer some opportunity to validate the assumption of uniformity in medical supply prices. Data on geographic variation in supply prices across Census Divisions for individual medical supply items could be purchased for about $250 per item. However, these data provide no information on potential variations in supply prices within Census Divisions. It seems unlikely that IMS data would be adequate for use in the OGPCI, given its level of geographic aggregation.

One possibility for dealing with all categories of inputs in the OGPCI that do not have readily available input price proxies would be to follow the approach used to adjust PPS capital payments to hospitals. By regressing a measure of expenses for equipment, supplies and "other" inputs on one or all of the other price proxies (e.g., employee wages or office rents), it might be possible to "estimate" a potential price proxy. This is how the Hospital Wage Index raised to the 0.46 power was selected as the geographic adjuster for capital payments. In fact, this regression based approach was adopted even though some actual alternative price indices were available. In light of the apparent lack of any data options in this area of the OGPCI, an estimated price proxy may be acceptable. We suspect that the ability to estimate a price proxy with a regression using physician expense data will be questioned because expense data would be available for only a

very small proportion of physicians. When this approach was used for a PPS capital adjuster, the regression was based on data from almost all hospitals covered by the regulations.

B. ANALYTIC APPROACH

Data Sources

The data source for actual practice expenses is the American Medical Association's Socioeconomic Monitoring System (SMS) described above. This is a physician survey designed to gather data on practice characteristics such as fees, hours worked, expenses, and incomes. Prior to using these data to analyze geographic variation in expenses per physician, it is important to establish what types of geographic areas can be identified. The Medicare payment localities are appropriate areas to use. To the extent feasible, we identify physicians in the SMS according to the Medicare locality in which their office is located. This can be done because AMA has a county identifier for each physician and most localities are aggregations of counties. (The main exceptions to this occur in California, Mississippi, North Carolina, Arizona, and Connecticut.) AMA agreed to assign a locality identifier for every locality in which the 1990 and 1991 SMS contains 20 or more physicians. For confidentiality and statistical reasons, localities with fewer physicians were not identified separately. Physicians not assigned to a unique locality were given a geographic identifier related to an aggregation of localities.[5] However, no area is identified unless it contains at least 20 physicians in the SMS data.

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[5]AMA also assigned state and Census Division identifiers, as sample size permitted, where localities or aggregations of localities within carriers proved to have insufficient sample size. However, in this study all geographic identifiers that were used to assign the appropriate OGPCI to each physician observation were based on localities of aggregations of localities.

This algorithm results in physicians in 205 of the 232 localities receiving a locality-based geographic identifier. Eighty localities are identified uniquely. The remaining 125 localities are identified through 14 locality groups. In no instances were localities from different carriers grouped together. In order to have a set of OGPCIs consistent with the geographic identifiers, for each locality group we created a weighted-average OGPCI across all localities in the group, where locality population was used as the weight.

The 205 localities represented in the SMS physician sample have slightly above average OGPCIs. The population-weighted OGPCI is equal to 1.004 across the 205 localities.[6] For the 27 localities not represented in the SMS sample, the corresponding value is 0.958. This implies that the sample is not capturing physicians in some lower cost areas that tend to be either rural or small cities.

The two price proxies used in the present OGPCI will be used in this analysis. Other price proxy data are also used here. Alternative office rent proxies are considered that make better use of the available HUD FMRs. In particular, we base potential new indices on more recent HUD data and/or on averages across several years of data in order to limit the influence of annual fluctuations. Using several years of FMRs to create an index would be consistent with the approach used to smooth the malpractice GPCI. In the case of malpractice, the GPCI was based on two years of data--1985 and 1986. These were the most recent years available at the time the malpractice index was computed. In the case of the rental index, one alternative that we explore is an index that incorporates data from the most recent three years of FMRs currently available--1988, 1989, 1990. In addition, we compute a rental index based only on 1990 FMRs. Prior to

[6]The population-weighted average OGPCI is equal to 1.014 for the 80 localities identified uniquely and 0.975 for the 125 localities identified as aggregates.

analyzing these alternatives, we compare the current rental index to the options suggested here. Our goal is to assess how sensitive the rental index is to the method applied to the HUD apartment rents. These results are reported in Appendix F.

An alternative employee wage proxy is the Hospital Wage Index used to compute PPS payment rates. The original reluctance to use the PPS Wage Index in the OGPCI was based largely on the fact that a conceptually superior proxy would not only reflect the occupation mix in physicians' offices, but would also hold this mix constant across geographic areas. The PPS Wage Index allows for neither of these goals to be met. Studies show that not being able to control for occupational mix differences in the PPS Wage Index may lead to some distortions in measuring wage differentials for hospitals (Pope 1989; Williams, Pettengill, and Lisk 1990). The 1980 Census data provided wages at a sufficiently detailed occupation-specific basis to allow for an index that reflects physicians' employees and hold occupation-mix constant across areas.

While the Census data is conceptually superior the PPS Wage Index, the fact that it is based on data from 1980 is a drawback. Despite its conceptual shortcomings, however, the only obvious alternative price proxy would be the PPS Wage Index. This index is based on wage data from the health care sector and is more current than the Census data. Therefore, we plan to use the PPS Wage Index as an alternative to the Census-based proxy in the OGPCI.[7]

[7]It might also be possible to use changes in the PPS Wage Index as away of updating the Census proxy more frequently than once a decade. However, this would require that a 1980 baseline version of the PPS Index be available so as to make it comparable to the Census data. In addition, there should be some evidence that changes in the PPS Index were at least representative of changes in hospital wages. It would even be more credible if changes in the PPS Index were shown to be comparable to wage changes for the occupations in the current proxy or to wage changes in general.

Methods

The unit of observation in this analysis is the individual physician. Expenses for employee wages, office rents, medical equipment, medical supplies, and "other" expenses will be studied. There are three basic steps in the analysis. First, we determine the extent of systematic geographic variation in the physician-level expense data. Second, we use the present overhead GPCIs to explore the share of the systematic geographic differentials in expenses that is related to the GPCIs. Finally, we examine alternative OGPCIs that may explain variation in practice expenses per unit of input.

The basic statistical method in all stages of this analysis will be ordinary least-squares regression. All expense variables are expressed per unit of input. Measuring expenses per unit of input is not entirely straightforward because the SMS survey requests expenses on a per physician basis and input quantities on a per practice basis. The ratio of expenses to input quantities, as surveyed, would understate expenses per unit of input for group physicians. We need to determine the share of the input quantity that each group physician's expenses are covering. The best approach to this would be to assume that the input quantity share is equal to the share of total practice expenses that the physician is reporting as his or her own. Unfortunately, SMS does not request this type of information. The best we can do, given the data, is to assume that inputs are shared equally by all owners of a group practice. To the extent that this assumption is inconsistent with expense sharing arrangements, this leads to measurement errors in expenses per unit of input. However, since there is little reason to believe that these

types of errors are systematically related to where a practice is located, it should not bias our conclusions about geographic variation or the relationships to the GPCIs.[8]

Models will be estimated that use (1) office expenses per square foot of space,[9] (2) wages per non-physician employee, and (3) other overhead expenses as dependent variables. This last category of expenses relates to equipment, supplies and "other" expenses. Separate models will be estimated for each of these three components of other overhead expenses as well. Estimating the extent of geographic variation in other overhead expenses per unit of input is difficult because the precise nature of these inputs and their appropriate units cannot be easily defined. One might imagine that these expenses are proportional to practice outputs and, as such, could be expressed on a per visit basis. Unfortunately, the data set the AMA was willing to make available did not include output measures. Therefore, in our model, we assumed that equipment, supplies and other expenses would be proportional to other inputs and have chosen to analyze variation in these costs per unit of non-physician personnel.[10]

In the first stage of the study, we determine the degree of systematic geographic variation in overhead expenses by regressing each of the dependent variables on a categorical variable denoting the physician's specialty, a set of dummy variables representing each of the localities or areas identified in the data, and a variable denoting the survey year (1991=1). Specialty is included as a way of capturing service mix differences across areas. This is important since the

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[8]Some measurement errors could be introduced if expense sharing is related, say, to practice size that does vary with geography. This would weaken the observed relation between the OGPCI and expenses per unit of input.

[9]The data used to construct the weights in the current OGPCI show that office expenses account for about 11 percent of practice revenues, nonphysician employee wages for about 16 percent, and other overhead for about 13 percent. The remaining revenues are accounted for by physician net income (54 percent) and malpractice premiums (6 percent).

[10]Office square footage was not used because it was missing from the data more frequently.

extent of geographic variation in fees is not uniform across services, but varies depending on the relative importance of work, malpractice, and overhead relative values. Since different specialties typically provide very different services and have different practice input needs, it could be misleading to analyze expense variation without properly controlling for specialty. The overall R-square from this regression provides an upper bound on the degree to which systematic geographic differences contribute to explaining actual expense variation.

In the wage and other overhead expense models, we also include a variable to control for the share of the practice's personnel that are employed on a part-time basis. The survey provides data on the total number of non-physician personnel and the number that are full-time. Therefore, we know the share of the personnel that are part-time but not the equivalence between full-time and part-time workers. Rather than make an arbitrary assumption about this, e.g., each part-time workers equals one-half of a full-time worker, we simply control for the part-time share. In addition to the obvious need to control for variations in the meaning of the personnel quantity variable across physicians, this control for part-time employment is important in this study because it is significantly related to geography and, as such, the GPCI. Not including a part-time control variable would result in a biased estimate of the relationship between expenses per unit of personnel and the GPCI.

In the second phase of the study, we estimate models that use the components of the original OGPCI in place of the locality or area dummy variables. This allows us to assess the accuracy of the current price proxies. The R-square in these models will be lower than the R-square in the first set of models. However, the R-square from these models relative to the models with area dummies can be viewed as a measure of the degree to which the OGPCI explains the systematic geographic variation in overhead expenses, as measured by the SMS

survey data. Moreover, if the coefficient estimate suggests that the components of the OGPCI move proportionally with expenses per unit of input, then the adjustments to the fee schedule can be thought of as tracking actual costs quite well. Statistically, this means that estimated elasticity of expenses per unit of input with respect to the OGPCI would not be significantly different from 1.0. The most direct way to estimate this elasticity is to regress the log of the expense variable on the log of the OGPCI. The coefficient is the elasticity. For this reason, all models express the dependent variable and the price proxies in logs.

The model specification used here is quite parsimonious. We are not trying to fully explain variation in expenses per unit of input. If that were the case, variables such as practice size (numbers of physicians), years of experience, affiliations with managed care plans, and detailed area descriptors (e.g., per capita income or population density) might be included in the model. However, none of these factors are recognized, or are likely to be recognized, in the Medicare Fee Schedule. Instead, we focus on the relationship between expenses and the geographic adjusters, holding constant only those factors that affect payments under the Fee Schedule. The effect of some of the other more general regressors could be captured by one or more of the included variables, depending on the correlations between the included and omitted variables. Given the context of this study and the questions being explored, these types of biases are not of concern. For example, the estimated effect of the rental component of the OGPCI on office expenses per square foot would be strengthened if we omitted practice size and this happened to be positively related to both the expense variable and the rental index. All this would mean, however, is that the current rental index would be adjusting for cost differences that are due to factors other than input price differences.

In the third stage of the study, we reestimate the input price models using alternative proxies for the OGPCI components as explanatory variables. In particular, the PPS Wage index and the expanded set of FMRs will be contrasted with the current indices for employee wages and office rents. If the alternative OGPCI regressions result in a substantially higher R-square or an elasticity estimate closer to 1.0, then the alternative could be viewed as superior to the current index. In this context, "superior" means that it does a better job of explaining actual expenses. Physicians and their representatives might find this definition appealing. However, if one believed that variations in expenses were being driven by inappropriate differences in input use, then the fact that an alternative was better able to explain actual expenses might not matter very much. Such inappropriate differences might relate to geographic variation in the composition of a practice's workforce or the types of buildings in which offices are located.

As part of the search for alternative OGPCIs, we consider the ability of the wage and rent proxies to explain variation in equipment, supplies, and "other" expenses per unit of labor. We assess the two original indices, the three alternatives for wages and rents as well as functions of the indices. For example, a weighted average of a wage index and a rental index could be viewed as a credible adjuster for equipment, supplies, and "other" expenses. One option that will be considered is a composite index that gives equal weight to the current wage and rental indices. An index that yielded a reasonable R-square relative to the regression with the area variables and an elasticity close to 1.0 would have to be considered as a reasonable price proxy for other overhead expenses in the OGPCI.

C. RESULTS

Table III.1 reports the results of the regressions including the area dummy variables. Since the most relevant information contained in these models relates to the joint significance of the area coefficients, we show the adjusted R-square and the F-statistic testing the null hypothesis that all the area coefficients are zero. Rejecting this hypothesis implies that there is some significant variation in the level of expenses per unit of input across the Medicare pricing localities, and the aggregations of localities, that we observe. For all six dependent variables, the results lead us to reject the null hypothesis of no geographic variation. This is consistent with the OGPCI approach toward wages and rental costs. However, these results suggest that other overhead expenses, in total and by component, also vary geographically and this is not consistent with the OGPCI assumption of no variation in these expenses. As a result, the treatment of other overhead expenses in the OGPCI may need to be reconsidered.

Obviously, other overhead expenses could vary geographically for reasons that are within physicians' control. These reasons might relate to, for example, how office-based services are organized relative to those provided in hospitals and how practice styles are determined by patient and physician preferences. Factors such as these would not be compelling reasons to adjust overhead expenses, since the OGPCI is intended to reflect geographic variation in input prices that the physician cannot control. However, one cannot exclude significant differences in input prices as the cause of the systematic geographic variation in other overhead expenses. In fact, factors other than pure input price differences could also be related to variation in wages and office expenses. Overall, though, it appears that there is sufficient variation in other overhead relative to wages and rents so as to warrant exploring revisions in the OGPCI that reflect this variation.

Table III.1

Geographic Variations in Physician
Expenses per Unit of Input

Expense Category	Sample Size	Adjusted R-square	F-statistic[a]
Wages per Non-physician Employee	2,541	0.067	1.29*
Office Expense per Square Foot	1,681	0.045	1.48**
Other Overhead per Non-physician Employee	2,363	0.067	1.36*
Supply Expenses per Non-physician Employee	2,245	0.081	1.29*
"Other" Expenses per Non-physician Employee	2,390	0.072	1.36*
Equipment Expenses per Non-physician Employee	1,736	0.118	1.29*

a. Null hypothesis is that all area coefficients are simultaneously equal to zero (i.e., no variation across areas).

* p-value < .05; reject null hypothesis
** p-value < .01; reject null hypothesis

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Focusing back on the components of the OGPCI that do currently contribute to the variation in Medicare fees, Table III.2 reports the regression results for wages per employee and office expenses per square foot. The first and third columns show the analysis of the current OGPCI price proxies. Using the price proxies instead of the area dummies lowers the adjusted R-square, although the reductions are quite small. In the case of wages per employee, however, the loss in degrees of freedom in the model with area dummies seems to offset the gains in explanatory power relative to the model employing the price proxy. In the case of office expenses per square foot, the adjusted R-square falls from .045 to .037, suggesting that the rental index explains about 80 percent of the systematic variation across areas.

These similarities between the proxies in terms of goodness-of-fit extend to the estimated elasticities of expenses with respect to the price proxies. Both of the current proxies have expense elasticities that are significantly different from 1.0. For employee wages, the elasticity is estimated to be 0.59; for office expenses, the elasticity is 0.62. Our estimates are similar to those of Gillis, Reynolds, and Willke (1991) in both a quantitative and qualitative sense. They found elasticities in the range of 0.5 to 0.6.

These estimates mean that physicians' actual expenses for employees and office space per unit of input vary less than the geographic indices used to adjust Medicare fees. In terms of these components of the Medicare payment, it appears that the OGPCI is, at least, reflecting the actual variation in the outlays made by physicians to run their practices. In fact, based on these data, it may be that the high values of the price proxies are "too high" and low values "too low" relative to the differentials in actual expenses per unit of input. This would suggest that the OGPCI is "over-adjusting" fees relative to geographic variation in observed expenses per unit of

Table III.2

Regression Analysis of Wages and Office Expenses Using Current OGPCI Price Proxies and Alternatives (t-statistic in parenthesis)

	Wages per Non-physician Employee		Office Expenses per Square Foot		
	Census-based[a]	PPS Index	1987 FMRs	1990 FMRs	1988-90 FMRs
PRICE PROXY	0.591 (4.58)	0.455 (5.01)	0.623 (5.61)	0.560 (5.41)	0.576 (5.42)
SPECIALTY[b]					
Internal Medicine	0.112 (2.31)	0.112 (2.32)	0.388 (3.67)	0.388 (3.67)	0.390 (3.69)
Other Medical	0.237 (4.16)	0.237 (4.17)	0.466 (3.82)	0.472 (3.87)	0.470 (3.85)
General Surgery	0.250 (4.35)	0.251 (4.38)	0.268 (2.16)	0.274 (2.21)	0.272 (2.20)
Other Surgery	0.326 (7.69)	0.325 (7.68)	0.429 (4.61)	0.429 (4.61)	0.429 (4.61)
Obstetrics/ Gynecology	0.159 (2.80)	0.162 (2.86)	0.346 (2.77)	0.345 (2.75)	0.345 (2.76)
Pediatrics	0.046 (0.81)	0.045 (0.79)	0.438 (3.71)	0.437 (3.69)	0.436 (3.69)
Radiology	0.513 (6.51)	0.512 (6.50)	0.301 (1.78)	0.296 (1.75)	0.296 (1.75)
Psychiatry	-0.281 (-4.16)	-0.280 (-4.14)	0.311 (2.55)	0.316 (2.59)	0.316 (2.59)
Anesthesiology	0.574 (7.14)	0.573 (7.13)	0.742 (4.45)	0.746 (4.47)	0.745 (4.47)
Pathology	0.387 (3.32)	0.382 (3.28)	0.038 (0.14)	0.045 (0.17)	0.041 (0.16)
Emergency Medicine	0.229 (1.46)	0.231 (1.47)	0.387 (1.07)	0.382 (1.06)	0.381 (1.05)
Other	0.092 (1.45)	0.092 (1.45)	0.369 (2.81)	0.377 (2.87)	0.375 (2.86)
Part-time Employee Share	-0.755 (-16.53)	-0.754 (-16.60)	N.A.	N.A.	N.A.
YEAR (1=1991)	0.086 (3.18)	0.085 (3.14)	-0.004 (-0.07)	-0.004 (-0.07)	-0.004 (-0.07)
Intercept	9.562	9.568	2.666	2.665	2.664
Adjusted R^2	0.181	0.182	0.037	0.036	0.036

a. In current OGPCI.
b. Omitted specialty is General and Family Practice
c. Reject null hypothesis of equality to 1.0 (p <.05).

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input and that input price adjusters based on actual expenses would result in fees with less geographic variability. On the other hand, it may be that the range of expense values reflected in the data do not fully reflect the range of values in the universe.

Alternative Indices

The remainder of Table III.2 presents analysis of the alternative approaches for measuring variation in the wage and rent components of the OGPCI. Recall, that as an alternative to the Census-based wage proxy, we consider the PPS Hospital Wage Index. Two alternatives to the rental index based on the 1987 FMRs are employed--one based on 1990 FMRs (the most current year of data available) and one based on an average of the three most current years (1988, 1989, and 1990). In general, the rental alternatives perform about the same as the original proxy. The R-squares and the elasticities are almost identical.

The biggest change occurs when the PPS Wage Index is used instead of the Census-based proxy. The R-square remains about the same, but the elasticity falls from 0.59 to 0.46, about a 25 percent reduction. However, this difference is not statistically significant. This shows that there is less variation in wage expenses per employee than in either the PPS Index or the original proxy. Given the conceptual arguments against the PPS Index, however, and the lack of evidence that it does a better job of explaining actual expenses, it seems unlikely that it should be given serious consideration as an alternative proxy.

The rental alternatives, on the other hand, do appear to be viable candidates for use in the OGPCI. They have the conceptual strength of being based on more recent data. One of the options is also constructed so as to reduce variations due to annual fluctuations. Statistically, the estimated elasticities are the same as that of the original. Based on this analysis, using either of

the rental indices derived from more recent FMR data would seem feasible. Moreover, as seen in Appendix F, moving to either alternative changes the rental proxy by less than 5 percentage points in over 85 percent of the localities. Given the data, larger changes reflect, in all likelihood, actual changes in local rental markets. Obviously, there would be some redistribution associated with a proxy based on more recent data. The policy tradeoff is between avoiding redistribution in updating the rental GPCI and enhancing the credibility of the proxy by basing it on the most recent available data.

Equipment, Supplies, and Other Expenses

Table III.3 presents the results of this preliminary search for an adjuster for the components of the OGPCI that are currently assumed constant across areas. The results of regression models for all other overhead expenses and each of the components identified in the AMA data are summarized. We report the estimated elasticity of these expenses per employee with respect to the various price proxies. Variables controlling for specialty, year, and the extent of part time employment were also included in the model but are not shown in the table. One model was estimated for each of the wage and rental indices used above (the PPS Wage Index has been omitted). In addition, a composite index giving equal weight to the current wage and rental indices was employed.

Focusing first on all other overhead, the results show that the elasticities with respect to the various price proxies are not the same. The rental indices, and the composite of rents and wages, are estimated to have elasticities significantly less than 1.0. The Census-based wage proxy, on the other hand, has an elasticity not significantly different from 1.0. This implies that

these other overhead expenses (measured per employee) are approximately proportional to wages, but are less than proportional to rents or the composite.

The results are qualitatively similar for each of the components of other overhead. In all cases, the elasticity of the expense variable with respect to a price proxy is largest for the Census-based wage proxy. However, for neither medical supplies or "other" expenses is this relationship proportional. Supply expenses appear to vary less than the wage proxy, while "other" expenses vary by more. Since "other" expenses include as diverse inputs as accounting services, continuing medical education, and a professional car, it is not surprising to find a higher degree of variation in this category than in wages. The relationship to the wage proxy is only proportional for medical equipment expenses.

Following the approach used in the PPS capital costs adjuster, these results suggest that some function of the wage proxy or the rental proxy could be used to adjust equipment, supplies and other expenses. However, developing different adjusters for each component of supplies, equipment, and "other" would probably mean relying on different proxies or different functions of proxies for each expense category. For example, using the regression estimates, the wage proxy raised to the 0.431 power would be an adjuster that was approximately proportional to supply expenses. However, an adjuster based on the rental proxy could also be derived. Moreover, for "other" expenses, an adjuster based on the composite of wages and rents might be slightly more defensible, i.e., its elasticity is not significantly different from 1.0. Since this is essentially an ad hoc approach, it might be difficult to choose between the various alternatives. A simpler, albeit still ad hoc, option might be to use a single adjuster for all three components of other overhead expenses, e.g., the Census-based wage proxy.

Table III.3

Elasticities of Potential Price Proxies for All Other Overhead Expenses Component of Overhead GPCI by Expense Category

Price Proxy Option	All Other Overhead	Medical Supplies	Medical Equipment	"Other" Expenses
1987 Fair Market Rents[a]	0.378	0.258	0.358	0.509
1990 Fair Market Rents	0.346	0.235	0.341	0.484
1988/1989/1990 Fair Market Rents	0.362	0.248	0.353	0.496
1980 Census-based Wages[a]	0.879*	0.431	0.869*	1.439
Composite of 1987 FMRs and 1980 Census-based Wages	0.563	0.358	0.540	0.806*

a. Used in current OGPCI.

* Accept null hypothesis that elasticity equals 1.0 (p > .10).

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D. IMPLICATIONS

This analysis shows that the two components of the Overhead GPCI that vary across localities--employee wages and office rents--are positively related to the corresponding elements of physicians' actual practice expenses. Even though the OGPCI was based on proxy input prices that did not necessarily reflect actual prices faced by physicians, the result is an index that reflects the systematic geographic variation in actual expenses reasonably well. Physicians may maintain that their own expenses per unit of input would be a more valid basis for geographic adjustments than proxy data. However, an index based on actual expenses would be implicitly allowing input mix to vary across areas, making the OGPCI difficult to interpret and hard to justify as a pure input price index.

In addition, these results suggest that an adjuster based on actual expenses for employee wages and office expenses might vary less than the adjuster based on the price proxies that were used. This follows from the finding that both wages and rents per unit of input are less than proportional to their respective price proxies, i.e., the estimated elasticities were less than 1.0. Economic theory would predict that expenses would vary less than input prices because physicians have the incentive to substitute toward lower-priced inputs. While this could occur across categories of inputs, e.g., substituting employees for equipment, it could also occur within categories, e.g., substituting licensed practical nurses for registered nurses. Our results are consistent with an underlying input demand behavior that reduces the variation in expenses relative to the exogenous variation in input prices.

These results also indicate that the ability of apartment rent variation, as measured by the FMRs, to explain office expenses does not appear to be affected by the year from which the data are derived. This implies that the rental index could be updated without being concerned that the

overall accuracy of the index will be greatly affected. In fact, for the large majority of areas, updating the rental proxy with either of the approaches reviewed here would result in very small (i.e., less than 5 percentage points) changes in locality values. Obviously, there would be some areas where changes would be larger. However, given the weight that the rental proxy has in the overall geographic adjusters (about 11 percent), even a change in this component of 15 percentage points would only result in, on average, less than a 2 percent change in Medicare fees.

The analysis of equipment, supplies, and other expenses suggests that the assumption of uniform input prices across localities may not be valid. While factors within physicians' control could be affecting the observed geographic variation on these expenses, the results are consistent with the view that there may be underlying differences in the prices for these inputs that the current OGPCI does not capture. Unfortunately, there are no credible sources of actual or proxy input price data upon which to base an index for this component of the OGPCI. In lieu of this, we explored the feasibility of an ad hoc adjustment based on the wage and/or rental proxies that are available. It appears that an adjuster might be developed that is close to proportional to these other overhead costs, when expressed on a per employee basis. Since all of the expenses reflected in this component of the OGPCI together have a weight only slightly larger than office expenses, introducing an adjuster is not likely to have a major redistributive impact on fees.

Clearly, a major conceptual problem related to choosing an adjuster for other overhead expenses category is that this is a diverse and, at this point, poorly defined set of inputs. Therefore, being able to argue convincingly that a particular price proxy is appropriate may be difficult. In addition, using the ad hoc adjusters for other overhead considered here would tend to increase fees in high-cost areas (largely urban) and decrease fees in low-cost areas (largely rural). Policymakers may not feel that this is a very high priority. However, if the objective of

the geographic adjuster is to track input price variation (as measured by expenses per unit of input), then some change in how this component of the OGPCI is treated should be considered.

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IV. POTENTIAL IMPLICATIONS FOR ACCESS IN AREAS EXPERIENCING LARGE REDUCTIONS IN PAYMENTS[1]

As noted in the introduction, Congress reformed Medicare physician payments as part of the Omnibus Budget Reconciliation Act of 1989 (OBRA 89).[2] Congress was concerned that access to care might be adversely affected by these payment reforms. Section 6102 (g)(7) of OBRA 89 requires the Secretary of Health and Human Services (HHS) to monitor changes in beneficiary utilization of and access to services and to report to Congress annually. The Physician Payment Review Commission (PPRC) is directed to comment on the Secretary's report.

HHS is directed to report on changes in utilization and access by geographic, population, and service related categories and to examine the factors which may contribute to such changes. In practice, both HHS and PPRC will monitor access and use under the MFS. The strategy both HHS and PPRC propose is to assemble pre-MFS utilization data to serve as a baseline for comparing post-MFS utilization.[3] The Common Working File (CWF) will serve as the primary data source for beneficiary utilization data. The CWF will be supplemented by other data sources such as the Current Beneficiary Survey (CBS). Both HHS and PPRC plan to examine access from the perspective of the provider as well.

Utilization rates will serve as the primary measure of access for both HHS and PPRC. Utilization measures include whether any physician contact occurred during the year, total physician utilization, and utilization rates for key services (e.g., primary care visits, high

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[1] This chapter was written by Mark E. Miller and Stephen Zuckerman.

[2] P.L. 101-239.

[3] See Sullivan (1992) and PPRC (1992) for complete discussion.

technology diagnostic tests). Special attention will be paid to the utilization by certain vulnerable beneficiary groups such as the disabled, the very old, the poor elderly, minorities, and those in rural areas, areas with high poverty rates, Health Professional Shortage Areas, and areas with historically high or low physician fees. The utilization rates of these groups will be monitored over time and compared to the Medicare population as a whole. Hospital admission rates will also be examined--the failure to admit for certain key conditions could indicate a lack of access. Using the physician as the unit of observation, utilization of selected services across categories of physician, site of service (e.g., outpatient department versus private office), and geographic area will also be examined.

In summary, both HHS and PPRC plan to use a pre-/post-MFS analytical framework, depending primarily on an array of utilization rates, to monitor access. While entirely reasonable, this approach has two shortcomings. First, as acknowledged by HHS and PPRC, utilization is not a perfect measure of access. An area with high utilization (per enrollee) may still have access deficiencies since high utilization does not necessarily mean that all beneficiaries are receiving care or receiving appropriate care. Similarly, a reduction in utilization may not reflect access reductions; rather, a reduction may reflect the elimination of inappropriate services or the substitution of a new technology or procedure. Second, as is often the case with monitoring systems, if a reduction in utilization emerges that is found to reflect reduced access, by definition access has already been denied.

This chapter of the report examines the potential impact of the MFS on access, approaching the issue from a different perspective. The study mandate language drafted by Congress clearly expresses a concern for those payment localities experiencing disproportionately

large fee reductions. Section 4115(a)(3) of OBRA 90 (P.L. 101-508) states that the Secretary of HHS shall report on:

> "the impact of the transition to a national, resource based fee schedule for physician services under Medicare on access to physician services in areas that experience a disproportionately large reduction in payments for physicians services under the fee schedule..."

Thus, to be consistent with the statutory language and because the assumption is reasonable in its own right, the analysis that follows assumes that areas likely to experience disproportionate fee reductions under the MFS are at the greatest access risk.

Previous simulations by HCFA and the Urban Institute have identified Medicare payment localities likely to experience disproportionately large reductions under the MFS. The present study determines whether these losing localities exhibit warning signs for access problems, by examining a series of measures that characterize the access "environment" in the locality.[4] The potential for access problems is assessed by comparing the characteristics of losing localities with other localities. As such, this study is complementary to the pre-/post-MFS monitoring frameworks discussed above because it attempts to anticipate access problems.

The next section of this chapter outlines the analytical framework and data construction as well as the methods and caveats. A more detailed discussion of the construction of each variable can be found in Appendix G. The third section reports the access environment analysis comparing losing localities with all other localities. Since generalization regarding the losing localities as a group may obscure variations among these localities, section four analyzes the access environment among losing localities. Implications are found in the fifth section.

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[4] We stress that the study does not purport to measure access directly.

A. ANALYTICAL FRAMEWORK AND DATA CONSTRUCTION

Objectively defining access is difficult; however, a definition might potentially encompass contact with a qualified provider at an appropriate site of care within a reasonable period of time, continuity of care, an appropriate amount of service, and the provision of key services and technologies appropriate to the illness. Clearly, applying such a definition involves considerable subjective judgement. Given the current state of medical practice and the existence of large data systems, claims-based utilization data and surveys of beneficiaries and providers are probably the best available ways to measure utilization and, in turn, access. As noted above, utilization is an imperfect measure of access.

Another key problem in undertaking an analysis of access is attributing changes in access to the MFS. Many changes are occurring in Medicare which could also affect access. As noted, limits on balance billing and volume performance standards were implemented concurrently with the MFS, and Medicare has placed limits on reimbursement for certain "overpriced" procedures, all of which could affect access. Furthermore, private insurers are restructuring benefit packages and instituting utilization controls, state governments are attempting large-scale health care reform, state Medicaid programs are struggling to contain costs while implementing recent eligibility expansions, and new technologies and procedures are continually being introduced. These changes affect physician practice styles which, in turn, affect utilization patterns and access.

To attribute access impacts to the MFS, control groups are necessary. These control groups could be outside Medicare completely or groups within Medicare that are less affected by the MFS. Given the two large-scale pre/post utilization monitoring efforts that are underway, and the problems of measuring access with utilization data and attributing impacts to the MFS, this

study pursues the question of access using an alternative analytical framework. Rather than depending solely on measures of utilization, an array of measures related to the access environment are developed. It is assumed that the threat to access is greatest in localities experiencing large reductions under the MFS. Thus, the access characteristics of losing localities are compared with those of all other localities to assess the relative risk for access reductions.

The analytical framework for measuring the access environment is based on Andersen and Newman's (1973) model of health care utilization. Andersen and Newman organize the influences of individual utilization into three broad classes of characteristics: health status, predisposing, and enabling. Health status characteristics refer to an individual's disability or illness; predisposing characteristics refer to an individual's social, attitudinal, and demographic characteristics; and enabling characteristics refer to individual and community attributes affecting the individual's ability to obtain health care, such as, income, medical insurance, and supply of health care services. For this analysis we adopt Andersen and Newman's model and assume that characteristics affecting access and utilization at the individual level are consequential at the locality level. Furthermore, we expand on the number of enabling categories such that they now distinguish enabling characteristics relevant to the Medicare population. Table IV.1 reports the modified Andersen and Newman categories and the measures included under each category.

<u>Responses to the Fee Schedule</u>. Before moving to the discussion of the analytical framework and the access characteristics, it is important to address the issue of physician and beneficiary response to fee reductions. Much of the impact of a MFS reduction on access depends on two behavioral responses about which very little is known with any empirical certainty--the responses of physicians and beneficiaries to changes in the Medicare fees.

Table IV.1

Access Environment Variables

Health Status

Mortality Rate--All Causes

Mortality Rate Ages 65-74
Mortality Rate Ages 75-84
Mortality Rate Ages 85+
Age-Adjusted Mortality Rate Ages 65+

Mortality Rate--Disease-Specific

Female Cancer Deaths
Male Cancer Deaths
Heart Disease Deaths
Other Cardiovascular Deaths
Flu and Pneumonia Deaths

Casemix

Medicare Inpatient Physician Service Casemix

Predisposing

Medicare Enrollee Composition

Percentage Aged Less Than 64
Percentage Aged 80 to 84
Percentage Aged 85 or Greater
Percentage NonWhite

Urbanization

Population Density

Table IV.1 (continued)

Access Environment Variables

Enabling--Income and Economic Stress

Income/Poverty
- Per Capita Personal Income
- Percentage of Population Below Poverty

Insurance Coverage
- Percentage Uninsured
- Percentage Medicaid Insured

Unemployment
- Unemployment Rate

Enabling--Health Service Supply

Physician Supply
- Patient Care Physicians Per Capita
- Physician Density

Physician Composition
- Percentage Primary Care
- Percentage Surgery Specialists
- Percentage Medical Specialists
- Percentage Radiology, Anesthesiology, and Pathology Specialists
- Percentage Office-Based

Hospital Beds
- Short-Term General Hospital Beds Per Capita

Access Environment Variables

Enabling--Practice Style

Medicare Utilization Rates

- Age-Sex Adjusted Admission Rate
- Casemix-Adjusted Physician Services Per Admission
- Adjusted Inpatient Physician Services Per Enrollee
- Adjusted Outpatient Physician Services Per Enrollee
- Adjusted Total Physician Services Per Enrollee
- Length of Stay

Enabling--Medicare Market Share and Policy

Medicare Market Share

- Percentage of Population Insured by Medicare
- Medicare Inpatient Days as a Percentage of All Inpatient Days
- Medicare Inpatient Discharges as a Percentage of All Inpatient Discharges
- Percentage of Enrollees Enrolled in HMOs

Medicare Participation/Assignment

- Percentage of Allowed Charges Participating
- Percentage of Allowed Charges Non-Participating, Assigned
- Percentage of Allowed Charges Non-Participating, Non-Assigned
- Percentage of Allowed Charges Assigned (Participating and Assigned)

Medicare Fees Relative to Private Fees

- All Procedures
- Visit Services
- Imaging Services
- Major Procedures
- Ambulatory Procedures
- Diagnostic Tests

The extant literature hypothesizes that physicians face a public and private market for their services and that they can easily move between them in response to changes in relative fees.[5] Furthermore, some argue that within this public/private framework, physicians have the ability to induce demand among their patients. Thus, physicians facing fee reductions can respond in four ways. Physicians can respond by inducing more demand among Medicare patients. Within a Medicare utilization monitoring framework, this would be manifested as higher service volume and intensity per enrollee.[6] A more traditional labor economics response would be for the physician to reduce output for their Medicare patients. That is, service volume and intensity per enrollee declines in the face of a fee reduction. A third response assumes that physician behavior per patient remains unchanged in the face of a fee reduction, but physicians reduce the proportion of Medicare patients in their practices (i.e., restructure their practices from the public to the private market). This change in behavior would be manifested over time as a reduction in the volume and intensity of service per Medicare enrollee. Finally, physicians could engage in some combination of these responses. For example a physician could choose to

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[5] Physicians ability to easily move between Medicare and non-Medicare markets is an open issue. Nationally, Medicare accounts for approximately 24 percent of physicians revenues, suggesting that the Medicare market is not easily abandoned. In a given area, if the Medicare market share is large, physicians' ability to move between the markets may be reduced. Even if two areas had similar market shares, physicians' ability to move between markets will be affected by levels of competition. For example, an area with high HMO penetration among the non-Medicare population might increase competition for Medicare patients. Presumably, established physician practices with high proportions of Medicare patients will have less ability to change markets than new physicians. On the other hand, there is evidence that certain specialties have greater private market demand for their services affording them greater flexibility to move toward the private market. Thus, movement by physicians from the Medicare market toward the private market may vary by specialty.

[6] Estimating the actual level of the response is empirically difficult without a direct experiment. An induced demand response was assumed for the purpose of defining the MFS conversion factor. It was assumed that physicians experiencing fee loses would induce demand sufficient to offset half of the loss. No response was assumed for physicians experiencing gains in fees.

increase the volume of certain services for current Medicare patients while at the same time refuse new Medicare patients.

The response of the beneficiary is also important. Presumably, a beneficiary will respond to lower fees by increasing demand for services. Additionally, limits on balance billing effectively lower the price to the beneficiary, further increasing the likelihood of higher service demand. If met by the physician, this increased demand will result in higher volume and intensity of service per enrollee and would be hard to distinguish from the induced demand response.

Unfortunately, the assumed response on the part of physicians and beneficiaries to fee reduction makes the discussion of access characteristics complex. For example, one might argue that Medicare market share is an important access consideration, the argument being that areas with smaller Medicare market share are more susceptible to access reductions--physicians can more easily "walk-away" from Medicare. On the other hand, if physicians can easily induce demand (and/or beneficiaries increase demand) volume and intensity of services could actually increase.

Data Construction. Data sources for this analysis are the Health Resources Administration Bureau of Health Profession's Area Resource File (ARF), various Medicare beneficiary files (the Medicare Patient Analysis and Review file [MedPAR], the Part B Medicare Annual Data [BMAD] and the Denominator file, the Census Bureau's Current Population Survey (CPS), and the Health Insurance Association of America's Medical and Surgical Prevailing Healthcare Charges System (HIAA). Data are generally for 1989 and 1990. Non-Medicare data were obtained at the county level and counties were mapped to Medicare payment localities (the unit of analysis). In several instances variables have been age-sex adjusted using standard

epidemiological methods of indirect standardization in order to make more valid comparisons. In the discussion to follow, the construction of the variables will only be briefly noted. Appendix G provides a more detailed discussion of the source, year, and construction of each variable. Mapping counties to localities and age-sex adjusting are also discussed in Appendix G.

Health Status Characteristics. Localities with lower health status may be at greater risk for reduced access for two reasons. First, physicians in localities facing fee reductions may be less willing to see potentially complex Medicare beneficiaries if Medicare's payment is deemed to be inadequate for that case.[7] Or alternatively, physicians could respond to lower fees by doing less for <u>all</u> Medicare patients in these localities which have greater need. The health status category includes age-specific (i.e., 65-74 years; 75-84 years; and 85 or more years) mortality rates from all causes for the elderly, an age-adjusted mortality rate from all causes for the elderly, five disease-specific mortality rates (cancer, heart disease, other cardiovascular, and flu/pneumonia) for the total population, and a casemix measure based on Medicare inpatient physician services.[8] Note that disease-specific mortality rates have a traditional problem--different diseases have greater or lesser significance in different parts of the country. Thus, making comparisons across geographic areas can be misleading, even if age-sex adjustment has been undertaken.

Predisposing. The demographic composition of a locality may also have access implications, i.e., the presence of certain vulnerable populations such as the disabled, the very

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[7] More precisely, the physician work component of the fee schedule, even with modifiers, might be considered inadequate to compensate a physician for the additional effort. This argument could also be applied to physicians' willingness to treat certain vulnerable populations, (e.g., the disabled, the poor).

[8] The casemix index measures the relative complexity of admissions in terms of physician services. The index is discussed further in Appendix G.

old, minorities, and rural populations. The utilization rates for vulnerable populations are generally lower than average and these populations are thought to be in poorer health and thus more complex to treat. Consequently, physicians facing fee reductions under the MFS may be less willing to serve them. Because these populations generally have lower than average utilization coupled with greater need (i.e., lower health status), utilization reductions may be more consequential for this population. Predisposing characteristics are measured using the composition of Medicare enrollees in the locality: the percentage aged 64 years or less (a proxy for the disabled), the percentage aged 74-85 years and 85 years or more (the very old), and the percentage non-white. Population density measures the degree of urbanization in the locality.

Enabling Characteristics--Income and Economic Stress. Areas with higher incomes are less likely to be at risk for access problems because beneficiaries can more readily meet deductibles and copayments, pay higher fees when physicians choose to balance bill, and purchase expanded insurance coverage (i.e., Medigap policies). Consequently, higher-income areas are likely to have higher demand for health services and thus higher utilization levels.[9] In addition to income, this enabling category attempts to measure the degree of economic stress in the community. High degrees of economic stress will put a strain on the health care system through increased numbers of uninsured and lower health status.[10] Greater degrees of economic stress are expected to increase the concern for access, particularly in the face of fee reductions. Income for the locality is measured using per capita disposable income. Economic stress

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[9] A counter argument could be made that higher incomes increase the physicians ability to move from the Medicare to the non-Medicare market. That is, in the face of falling Medicare fees, physicians could attempt to change the mix of their practices to include more non-Medicare patients.

[10] The counter argument here is that high proportions of uninsured increase the importance of the Medicare insured to providers.

variables include the localities' unemployment rate, percent uninsured, percent insured by Medicaid, and percent of persons below poverty. Note that all measures in this category refer to the total population of the locality, not just the Medicare population. The CPS is the source for the insurance coverage and poverty variables.

Enabling Characteristics--Supply. Obviously, the supply of health care resources is likely to directly affect access to care, and presumably greater supply will be associated with greater access. However, with respect to physician supply, areas with greater supply are also likely to have greater specialization. Certain physician specialties may have greater non-Medicare demand for their services and could thus choose to reorient their practices toward the privately insured as a result of the MFS. This category of variables includes (nonfederal, patient care) physicians per capita, physician specialty composition (e.g., percentage primary care, percentage surgical specialists), percentage of office-based physicians, hospital beds per capita, and physicians per square mile (as a proxy for travel time). Again, this category of variables pertains to the total population of the locality.

Enabling Characteristics--Practice Style. In addition to the supply of physician services, the community practice style is important. There is a substantial literature on area variations in utilization (Wennberg, Freeman, Shelton, and Bubolz 1989; Chassin et al. 1986 and 1987; Holahan, Berenson, and Kachavos 1990; Welch et al. 1992). This body of literature finds that even after controlling for variations in prices, casemix, and demographic composition, significant and systematic variations in utilization exist across geographic areas. Although these variations may in part be attributable to differences in the supply and mix of health care resources and the socio-economic characteristics of populations, the literature identifies physician practice style as a major explanatory factor.

The objective of this category of enabling characteristics is to explore differences in practice styles as measured by adjusted utilization rates. Localities that have historically had aggressive practice styles and thus higher utilization, are presumably less at risk for inadequate access, even in the face of fee reductions. That is, even if access were reduced, utilization levels may still be at or above the national average in localities that practice aggressively. Practice style is measured using various utilization rates for the Medicare population: the admission rate; length of stay; physician charges per admission; and average physician charges per beneficiary (inpatient, outpatient, and total).

This framework allows us to more fully analyze practice styles. For example, by disaggregating inpatient physician services into admission rates and charges per admission, variations in the decision to admit and the amount of services provided during the admission can be explored. One locality might admit more frequently but provide fewer services during the admission; whereas the reverse may true in another locality. Dividing physician charges per enrollee into inpatient, outpatient (i.e., noninpatient), and total allows us to explore the relative mix of services. Inpatient and outpatient physician services may act as substitutes for one another, for example.

To assure that the various utilization rates more precisely represent practice differences and to assure valid comparisons across localities, a number of adjustments were performed. To remove geographic variations in fees, all Medicare physician charges were deflated at the locality level using a Medicare prevailing charge index (Pope et al. 1988). Thus, the physician "charge" measures can be thought of as physician service volume and intensity, or for expositional purposes, physician "services." Physician services per admission were adjusted for casemix using a Medicare inpatient physician casemix measure developed in earlier research (Miller and Welch

1991) and discussed in Appendix G. The admission rate is age-sex adjusted. The inpatient physician services per enrollee figure is both casemix and age-sex adjusted because it is the product of the admission rate and services per admission. Outpatient physician services per enrollee is age-sex adjusted. The total physician services per enrollee figure is the sum of inpatient and outpatient physician services per enrollee. Twelve age-sex cells were used to age-sex adjust these Medicare variables: male/female; 64 years and less, 65-69, 70-74, 75-79, 80-84, and 85 and older.

Enabling Characteristics--Medicare Market Share and Policy. The amount and nature of Medicare insurance coverage is important to access and this final category of variables addresses these characteristics. Although Medicare is a federal program with uniform standards, significant variations in the program occur across localities. Many of the variations are driven by demographics. For example, the greater the elderly as a proportion of the locality's population, the greater Medicare's market share. Variation can also result because Medicare policy provides options to the enrollee (such as enrolling in an HMO) and the physician (such as accepting assignment). Finally, although the MFS establishes uniform fees, significant variations can occur depending on how those fees compare with fees for the privately insured within a locality.

To measure market share, we obtained the percentage of the population enrolled in Medicare, Medicare inpatient days as a percentage of all inpatient days, and Medicare discharges as a percentage of all discharges. The percentage of enrollees who have opted to enroll in HMOs as well as physician participation and assignment rates are also included to measure Medicare policy variation.[11] Participation and assignment rates are calculated on the basis of 1991 allowed

[11] With respect to Medicare, "participation" refers to the situation where a physician signs an agreement accepting Medicare payment as payment in full in all cases. There are two incentives to participate: a) beneficiaries face a lower price and presumably would find participating physicians more attractive (Medicare publishes directories of participating

charges in the locality (e.g., percentage of allowed charges provided by participating physicians). To measure relative fees, a series of indices measuring the ratio of MFS fees to private fees within the locality were constructed for all physician services as well as for five selected types of service--visits, imaging (e.g., x-rays, MRIs), ambulatory procedures (e.g., hernia repair, endoscopy), major procedures (e.g., CABG, arthroplasty), and diagnostic tests (e.g., cardiovascular stress test).

High enrollment in Medicare HMOs might reduce access concerns. High HMO enrollment might indicate satisfaction on the part of beneficiaries with Medicare benefits. It might also suggest that Medicare's bargaining power in the locality is sufficient to enter into agreements with providers. Finally, since HMO enrollment tends to be higher in areas with greater physician supplies, high enrollment may be an indication of greater physician competition.[12]

The implications of Medicare market share for access are unclear. Physicians are thought to face demand in multiple markets, e.g., publicly insured versus privately insured (Lee and Hadley 1981; Sloan, Mitchell, and Cromwell 1978). The empirical literature examining the determinants of physicians' willingness to provide services to Medicaid and Medicare beneficiaries is considerable. With respect to Medicaid, higher program fees increase the physicians' willingness to participate in the program and to increase the number of patients they

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physicians); and b) nonparticipating physicians have historically received lower fee updates and are paid 95 percent of the MFS amount. If a physician does not participate, Medicare payment can be accepted as payment in full on a claim-by-claim basis (referred to as "accepting assignment").

[12] It is entirely plausible that HMO enrollment is highly correlated with high historical utilization rates and charges. These conditions allow HMOs to compete more effectively--an inefficient fee-for-service market is more readily underbid and Medicare ties HMO payments to (95 percent of) fee-for-service payment. The HMO variable underscores one of the limitations of this framework (discussed in more detail below)--physician supply, physician utilization, and HMO enrollment are all likely to be highly correlated.

are willing to see (Sloan, Mitchell, and Cromwell 1978; Mitchell and Schurman 1984; Held and Holahan 1985; Long, Settle, and Stuart 1986).[13] Just as importantly, relative private fees also affect participation--as private fees increase, Medicaid participation declines. Given that Medicaid fees historically have not compared well to those for private insurers, that obtaining reimbursement is often administratively cumbersome, and that the program's importance to physician revenues is relatively small, physicians often choose to nominally participate or not to participate in Medicaid at all. This is particularly true of certain specialties.

Physicians' ability to leave the Medicare program is presumably more limited. Medicare beneficiaries are high utilizers of physician services and the program represents a larger percentage of physician revenues--approximately 24 percent of physician revenues. The literature on Medicare physician participation primarily pertains to the decision to sign a participation agreement (as defined above) or to accept assignment (Mitchell, Rosenbach, and Cromwell 1988; Mitchell and Cromwell 1982; Paringer 1980; Rice 1984; Rice and McCall 1983; Rodgers and Musacchio 1983). The findings in the Medicare participation literature are consistent with those in the Medicaid literature. Medicare fee levels are positively related to the decision to formally participate and accept assignment. Private fee levels and amount of private demand are negatively related to decisions to participate and accept assignment.

At its simplest, a larger Medicare market share may mean that physicians' ability to restructure their practices toward privately insured patients is more limited. It may not be economically feasible to abandon the Medicare market, even in the face of reduced fees.

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[13] An important distinction comes to light in this literature. If participation is defined as seeing one Medicaid patient during the year, physicians participation rates are high (e.g., 70-80 percent). However, if a stricter definition discounting "nominal" participation (e.g., less than 10 Medicaid patients in the practice) is used or if the definition takes into account the practice of refusing to accept new Medicaid patients, Medicaid participation rates are significantly lower (Hadley 1979; Welch and Miller 1988).

Furthermore, physicians could choose to stay in the Medicare market even with a reduced fee, if one assumes a physician's ability to induce demand--physicians may offset fee reductions through increased volume and intensity. Similarly, beneficiary demand is likely to be higher given that a reduced fee lowers the price of the service (and balanced billing is limited). However, even if market share is large, in the face of reduced fees, physicians could choose to limit or reduce their Medicare practices or reduce their level of output per patient (by increasing leisure time, for instance).

Beyond market-share, the nature of Medicare coverage is important. Physicians can also choose to participate and accept assignment and both decisions reduce the price of care to the beneficiary. Localities with higher participation and assignment rates might suggest two points with respect to access: a) physicians in the locality were satisfied with Medicare fees prior to the MFS and b) prices to the beneficiary are effectively lowered, potentially increasing demand for services, and presumably utilization. Historically higher participation and assignment rates might suggest a lower concern for access reductions in the short-run.[14] Finally, it should be clear from the literature that the relationship of Medicare fees to private fees are important. If fees under the MFS compare unfavorably with private insurance fees for the same services, physicians may restructure their practices toward the private insurance market.

<u>Defining Gaining and Losing Localities</u>. As noted above, OBRA 90 calls for an analysis of the impact of the MFS on access to physician services in areas that experience "disproportionately large reductions in payments." We define localities with disproportionately

[14] The upward trend in participation (and assignment) rates lends further support to the point. However, these increases should be viewed cautiously. There is considerable variation in these rates geographically and by specialty (Holahan and Zuckerman 1989). Given that the literature shows that these decisions are sensitive to Medicare fees, private fees, and the strength of private demand, they could change.

large reductions based on simulations performed by the HCFA Office of the Actuary (OACT) and Office of Research and Demonstrations (ORD).[15] These simulations estimated the impact of the MFS on payments per service. Or more precisely, the impact of the MFS is simulated assuming service volume and mix remain constant.[16]

The full MFS impact (i.e., the 1996 impact) was selected as the most appropriate measure for defining losing localities. Given past charging practices and the particular mix of services in a locality, any estimate that includes the effects of the transition rules may obscure the ultimate MFS impact. Urban Institute simulations show that localities can lose under the transition yet ultimately win and vice-versa. Nationally, the regulatory impact analysis estimated a 6 percent reduction in payments per service under a fully implemented MFS and double-digit (10 percent or greater) losses were defined as the disproportionate losses. Using a 10 percent reduction in payment per service as the definition, 51 localities qualify as disproportionate losers. These losing localities are the focus of this access analysis. Localities with disproportionate losses and gains (i.e., 10 percent increase or more in payments per service) are reported in Appendix I. (Note that the eight payment localities in Los Angeles are reported as a single entry.)

Defining a locality as a disproportionate loser requires some qualification. First, localities that have historically had high charges are more likely to experience larger reductions under the MFS. This is logically to be expected given that the MFS is intended to correct historical distortions resulting from the old fee-for-service charging methods. Second, the definition of a

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[15] See Federal Register November 25, 1991 p. 59612-59620. Note that no simulations were performed for Puerto Rico, although it is widely expected to face large reductions in payments per service. For a discussion of MFS impacts and access in Puerto Rico, see Appendix H.

[16] Simulations were undertaken by HCFA on Medicare payments (i.e., services * payment per service). However, given the disagreements in the literature as to how the MFS will affect service volume, we chose to base the definition of losing localities on payments per service.

losing locality is based on the average reduction (in payments per service) for the locality. This does not mean that all physicians in the locality lose--some may win and some may lose. Moreover, given that the MFS is intended to correct inequities in payments between cognitive and procedural services, losses are likely to vary by specialty and type-of-service within the locality. Third, if losing physicians respond by inducing volume, loses in total payments will be less than those for payments per service.

Also recall that the MFS legislation includes a four-year transition to the full MFS. The transition is specifically designed to ease the impact of the MFS. Arguably, physicians could be more accepting of payments reductions if they come in increments over time which could limit the potential for access reductions. However, our designation of localities with large reductions is based on the fully implemented MFS. Furthermore, our simulation analyses indicate that nationally, 44 percent of the full MFS impact occurs in the first year. (The transition formula is such that approximately 14 percent more of the impact will occur in each subsequent year through 1996.)

Methods. Our analytical approach is to determine whether the access characteristics of localities expected to experience large fee reductions are statistically different from other localities and thus warrant concern for access. In the following section, we test the hypothesis that losing localities are statistically different than other localities for each access variable. For each variable a two-tailed *t*-test between the mean for losing localities and the mean for all other (i.e., nonlosing) localities is presented. Significant *t*-test values indicate that the losing locality mean is statistically different than that of all other localities. Three statistical significance thresholds are reported (99, 95, and 90 percent confidence) indicating the level of confidence one

can have in the difference. In addition to the means for losing localities (n = 51) and nonlosing localities (n = 179), means for gaining localities (n = 39) and all localities (n = 230) are reported.

The analysis of means allows us to comment on systematic differences between losing and other localities. For example, do losing localities have systematically higher physician service utilization? Although losing localities tend to be larger metropolitan areas, there is marked diversity. For example, the losing localities include such large localities as Los Angeles, Manhattan, Miami, as well as medium and smaller cities such as Phoenix, Bakersfield, Small Georgia Cities, and Shreveport. Given this diversity it is reasonable to expect differences among the losing localities with respect to access characteristics. Thus we also examine differences in access characteristics among the losing localities.

Caveats. This study is descriptive in nature and as such should be considered indicative rather then definitive. Although we apply statistical tests to determine systematic differences between losing and other localities, we cannot conclusively state whether a given characteristic will result in access problems for the Medicare population. For example, higher per capita incomes would suggest less concern for Medicare access, but at the same time higher incomes may also make the non-Medicare market more attractive. Furthermore, we apply the statistical tests variable by variable, when in fact many of the characteristics covary--areas with high physician supply and specialty composition are also likely to have higher incomes and physician utilization. While multivariate techniques controlling for the effects of many variables at once would add further insight into the importance of these variables, a myriad of technical estimation issues (e.g., collinearity, exogeneity) would be raised. Finally, as noted above, physician responses to fee reductions cannot be predicted, which makes drawing conclusions difficult.

As noted above, the term "losing locality" refers to an average for all physicians in the locality--does not mean that all physicians in the locality lose (or that all physicians in a gaining locality gain). Within the locality there is likely to be variation in the MFS impact among physicians, specialties, and types of services. The analytical methods undertaken here are designed to provide insight to the potential for access problems rather than to definitively predict reductions in access.

The Medicare payment locality is the unit of analysis for this study.[17] This raises an issue when one considers measures of the access. Localities are defined by Medicare carriers strictly for physician payment purposes and locality definitions vary widely (e.g., the entire state, individual cities, groups of cities, contiguous counties, and discontiguous counties).[18] The validity of comparing access measures would be enhanced if they pertained to consistently defined health market areas, such as the MSA, and in rural areas, contiguous counties. There are several reasons that the locality must serve as the unit of analysis. Simulating MFS impacts at the locality level is appropriate since these are the units that will be affected. Localities are the basis of geographic practice cost (work, overhead, and malpractice) adjustments in the Medicare payment amount. Given the statutory decision to geographically adjust on the basis of locality it seems likely that if any further adjustments were considered in the interests of assuring access, they too would be applied at the locality level.

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[17] Medicare payment localities are defined in the Federal Register November 25, 1991, p. 59785-59790. Five California localities served by two different carriers were combined and as mentioned, Puerto Rico is discussed only in Appendix H.

[18] Note that Texas includes certain "super" localities where the payment area for certain specialties is defined to encompass multiple payment localities.

Related to the use of localities as the unit of analysis, is the issue of "border-crossing." Beneficiaries do not exclusively receive services in the locality where they reside. For example, beneficiaries can require care while traveling, can spend extended periods of time in a second residence, and can travel to other localities specifically to receive care (e.g., traveling from a rural to an urban hospital to receive surgery). Since most of the access measures are based on the residence of the individual (as opposed to the location of the provider) they can be thought of as "net" of border-crossing.[19] The implication is that we can describe a locality's access environment but we cannot describe the border crossing behaviors for that locality's beneficiaries. For example, a locality whose residents have average utilization rates and is expected to experience an increase under the MFS, is not at great risk for access reductions. However, if large numbers of beneficiaries in that locality are traveling to another locality for much of their care and this other locality is facing large fee reductions, access could be affected.

Using the locality as the unit of analysis also raises one final issue. The Andersen and Newman model specifies the individual-level (e.g., health status, income) and community-level (e.g., physician supply) determinants of utilization. As noted above, we have assumed that characteristics measured at the locality-level are indicative of the access environment. The access measures are averages for the locality and do not address variations in access within the locality. We have noted that within locality variations in MFS impact are to be expected. Similarly, access could be affected for certain services, areas, or populations within the locality.

[19] The participation and assignment rate measures and the fee indices are based on the location of the provider and are exceptions to this rule.

B. ANALYSIS OF MEANS--ACCESS ENVIRONMENT

In this section we compare means of the access environment variables for losing and other localities. Statistically significant differences between losing localities and other localities are established using a simple (two-tailed) *t*-test. The objective of this analysis is to determine whether there are systematic differences between losing and other localities that could affect access.

<u>Health Status Characteristics</u>. Table IV.2 reports means and *t*-test results for health status characteristics. In every instance where the *t*-test is significant, the mortality is lower in the losing localities. (Note that disease-specific indicators can be misleading because they are not age-sex adjusted and because the importance of the disease varies geographically.) Although the differences are small, losing localities have lower rates in all three age-specific categories and in the overall age-adjusted rate for the elderly. For example, the age-adjusted elderly mortality rate is 4.7 percent for losing localities and 5.1 percent for all other localities. These results suggest that access is not a concern by these measures: mortality rates are lower in localities experiencing large reductions.

The Medicare inpatient physician service casemix suggests another story, however. Losing localities have statistically greater in-hospital case complexity (1.07) than other localities (1.01).[20] This would suggest a potential access concern--physicians in localities experiencing significant fee reductions may be less willing to treat cases that are potentially more complex. However, it is important to bear in mind that using a casemix based on DRGs may not be a precise measure of case complexity. Wennberg, McPherson, and Caper (1984) argue that within

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[20] Note that the national average casemix is 1.02 because 1987 DRG weights are applied to 1989 admissions.

TABLE IV.2
Access Environment of Variables (a)
Health Status and Prediposing Characteristics

	VARIABLE MEANS				
	All Localities n=230	Gaining Localities n=39	Losing Localities n=51	Non-Losing Localities n=179	t-Test of Means Losing v. Non-Losing (b)
HEALTH STATUS					
Mortality Rate--All Causes					
Mortality Rate Ages 65-74	0.0270	0.0284	0.0252	0.0276	<.01
Mortality Rate Ages 75-84	0.0599	0.0620	0.0564	0.0610	<.01
Mortality Rate Ages 85+	0.1492	0.1488	0.1415	0.1516	<.01
Age-Adjusted Mortality Rate Ages 65+	0.0497	0.0511	0.0467	0.0506	<.01
Mortality Rate--Disease Specific					
Female Cancer Death Rate per 1000	1.3073	1.1690	1.3172	1.3040	NS
Male Cancer Death Rate per 1000	2.0500	1.9331	2.0644	2.0453	NS
Heart Disease Death Rate per 1000	2.0490	2.1638	1.8339	2.1200	<.01
Other Cardiovascular Disease Death Rate per 1000	1.8488	2.1386	1.7046	1.8964	<.01
Flu and Pneumonia Death Rate per 1000	0.3123	0.3426	0.2848	0.3213	<.01
Casemix					
Medicare Inpatient Physician Service Casemix	1.0224	0.9811	1.0743	1.0077	<.01
PREDISPOSING					
Medicare Enrollee Composition					
Percentage Aged Less Than 64	0.1319	0.1485	0.1256	0.1337	0.02
Percentage Aged 80 to 84	0.1074	0.1058	0.1067	0.1076	NS
Percentage Aged 85 or Greater	0.0863	0.0842	0.0841	0.0870	NS
Percentage Non-White	0.1085	0.1177	0.1397	0.0984	<.01
Urbanization					
Population per Square Mile	70.2707	45.5619	61.0155	73.9755	NS

a. See Appendix Table A-1 for data sources and year of variable.

b. Statistical significance is reported (90, 95, and 99 percent confidence). Statistically significant results indicate that variable means for losing localities are statistically different than that for all non-losing localities.

the current limits of medical appropriateness, physicians have wide discretion in assigning diagnoses and thus DRG.

The same patterns hold when losing and gaining localities are compared. Losing localities have lower disease-specific and overall mortality rates than gaining localities. However, inpatient physician casemix is substantially higher in losing localities (1.07) than in gaining localities (.98).

Predisposing Characteristics. Table IV.2 also reports a series of predisposing characteristics: the age and racial composition of enrollees in the locality and the degree of urbanization. Losing localities have statistically lower proportions of disabled (12.6 percent) than other localities (13.4), although the difference is small.[21] Losing localities have statistically greater proportions of nonwhites (14 percent) than other localities (10 percent). These same patterns hold when losing localities are compared to gaining localities. The population density results are noteworthy: there is no statistical difference between losing localities (61 persons per square mile) and all other localities (74 persons). However, there is a substantial difference between losing (61 persons) and gaining localities (46 persons)--gaining localities tend to be low density areas. Urban Institute simulations of MFS impacts indicated that gaining localities tended to be small metropolitan and rural areas.

The predisposing variables also suggest a mixed access picture. There is no statistical difference in the proportions of the very old between losing and other localities. There is a small but significant difference between losing localities and other localities with respect to the proportion of disabled. But, more importantly, losing localities have lower proportions of these two vulnerable groups--suggesting that systematic access reductions should not be a great concern for these populations. Similarly, since rural localities tended to experience fee increases, there is

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[21] Recall that the percentage of beneficiaries aged 64 and less serve as a proxy for the disabled.

no reason to anticipate systematic access problems for rural populations. The MFS, as intended, could contribute to increased access in rural areas. There is one area of concern with respect to vulnerable populations--localities expected to experience large payment reductions have larger proportions of elderly minorities. Because the losing localities tend to be large metropolitan areas, large absolute numbers of minority enrollees could be affected.

Enabling Characteristics--Income and Economic Stress. Table IV.3 reports means and *t*-test results for a series of enabling characteristics related to personal income and the degree of economic stress in the locality. Losing localities have higher per capita incomes ($18,384) than other localities ($17,384) (recall that this is income for the total population). The difference is relatively small, $1,000, but statistically significant. The difference in per capita income between gaining ($13,717) and losing localities ($18,384) is even greater. Assuming these income figures also reflect the circumstances of the elderly, higher incomes would suggest that beneficiaries are better able to meet deductibles, copayments, and balance billing amounts--particularly in the face of falling fees. Higher incomes may also mean that beneficiaries are more likely to have Medigap policies, or in other words, greater insurance coverage. The fact that losing localities have higher incomes should reduce concern for access, even in the face of MFS reductions.[22]

However, the analysis of means also shows that losing localities have statistically greater proportions of the uninsured (18 percent) and Medicaid insured (8 percent) relative to other localities (13 and 7 percent, respectively). These results could be considered a warning sign.

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[22] An alternative argument is that higher incomes increase the opportunity for physicians to induce demand in the non-Medicare market and/or to restructure their practice toward the non-Medicare market.

TABLE IV.3
Access Environment of Variables (a)
Enabling Characteristics--Income, Economic Stress, and Health Service Supply

	VARIABLE MEANS				
	All Localities n=230	Gaining Localities n=39	Losing Localities n=51	Non-Losing Localities n=179	t-Test of Means Losing v. Non-Losing (b)
ENABLING--INCOME AND ECONOMIC STRESS					
Income/Poverty					
Per Capita Income	$17,632	$13,717	$18,384	$17,384	0.08
Percent of People Under 100% of Poverty	0.1391	0.1573	0.1506	0.1353	0.02
Insurance Coverage					
Percent Uninsured	0.1394	0.1475	0.1778	0.1267	<.01
Percent Insured by Medicaid	0.0740	0.0682	0.0843	0.0707	<.01
Unemployment					
Unemployement Rate per 1000	0.0354	0.0372	0.0358	0.0353	NS
ENABLING--HEALTH SERVICE SUPPLY					
Physician Supply					
Patient Care Physicians per 1000	1.8957	0.9983	2.1651	1.8068	<.01
Physicians per Square Mile	13.3213	4.5483	13.2105	13.3656	NS
Physician Composition					
Percentage Primary Care	0.3163	0.4162	0.2887	0.3254	<.01
Percentage Surgery Specialists	0.2661	0.2507	0.2735	0.2637	.01
Percentage Medical Specialists	0.1544	0.1166	0.1656	0.1507	<.01
Percentage Radiology, Anesthesiology, and Radiology Specialists	0.0910	0.0828	0.0945	0.0899	0.02
Percentage Office-Based	0.7648	0.8482	0.7678	0.7639	NS
Hospital Beds					
Short Term General Hospital Beds per 1000	3.9788	3.6800	3.8872	4.0091	NS

a. See Appendix Table A-1 for data sources and year of variable.

b. Statistical significance is reported (90, 95, and 99 percent confidence). Statistically significant results indicate that variable means for losing localities are statistically different than that for all non-losing localities.

Localities with significant proportions of uninsured/Medicaid insured may already be facing access problems.[23]

The implications of higher proportions of the uninsured and Medicaid insured is unclear. On the one hand, Medicare fee reductions in such areas could contribute to access problems. Physicians in localities with greater proportions of the uninsured and Medicaid insured (Medicaid generally has lower reimbursement relative to Medicare) may submit higher charges to Medicare and private insurers to make up lost revenues. A Medicare fee reduction could encourage these physicians to move toward the private market. On the other hand, the physician's opportunity to abandon Medicare may be more limited in localities that have high numbers of the uninsured and Medicaid insured. Put differently, even in the face of declining Medicare fees, the Medicare population may remain a relatively attractive market. This is particularly true if physicians are also feeling pressures to contain costs from private insurers, or are practicing in localities with high HMO/managed care enrollment. Of course, in the long run physicians could choose to relocate.

Enabling--Supply. Table IV.3 also presents the results for a series of health service supply characteristics. Losing localities have greater physician supply and specialization. Physician supplies in losing localities (2.17 per 1000) are 20 percent greater than other localities (1.81 per 1000). Losing localities have more than twice (2.17 per 1000) as many physicians as gaining localities (1.00 per 1000). Physicians are also significantly more specialized in losing localities--approximately 29 percent of physicians in losing localities are primary care as

[23] While the Medicaid program has generally characterized as having access problems (Freund and Neuschler 1986; Hurley 1986), it is important to clarify that variations exist across programs. Medicaid access problems are probably most acute for obstetrical services (Mitchell and Schurman 1984). More generally, the proportion of Medicaid insured in a state is the function of the state's program design choices regarding breath of eligibility coverage, scope of services offered, and generosity of provider reimbursement.

compared with 33 percent in all other localities and 42 percent in winning localities. Results for physician density, office-based physicians, and hospital bed supply were not significantly different when losing and all other localities were compared.

The physician supply and specialization results should mitigate access concerns somewhat. Losing localities have large physician supplies, and consequently retaining market share may be critical. Ignoring the Medicare market, even in the face of fee reductions, may not be economically feasible for many specialists. Furthermore, Welch et al. (1992) find that areas with greater physician specialization also tend to have higher utilization rates.[24] This suggests that even if reductions in service were to occur (as opposed to excluding beneficiaries from their practices), these areas may still demonstrate utilization rates at or above the national average.

At least part of the reason an area is likely to experience reductions under the MFS is because of its degree of specialization. Recall that the MFS grants greater weight to evaluation and management services (although specialists can provide visit and consultation services). Urban Institute MFS simulations showed, not surprisingly, that losing locality fees have historically been higher, even after controlling for practice costs. This raises a potential concern for access. Given historically higher fees in these localities, the MFS reductions in these areas could be perceived as dramatic, and given the structure of the MFS, these reductions are likely to have their greatest impact on specialists. To the extent that specialists can easily move toward

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[24] The physician composition point is worth emphasizing--localities with greater proportions of primary care physicians (defined as general practice, family practice, and general internal medicine) will tend to receive fee increases under the MFS. Welch et al. (1992) have shown that physician composition is correlated with Medicare physician service utilization rates (i.e., volume and intensity) and that areas with greater proportions of primary care physicians have lower utilization rates. Welch et al. argue that physician composition influences community practice style and that greater proportions of primary care physicians result in a more conservative practice style. In short, one could argue that, as intended, the MFS rewards areas that practice more conservative medicine.

the privately insured market, they may be encouraged to do so. Holahan and Zuckerman (1989) have shown that private demand varies by specialty.

Enabling Characteristics--Physician Practice Style. Table IV.4 presents the physicians' practice style characteristics for the Medicare population, and losing localities appear to have different community practice patterns than other localities. Losing localities have lower Medicare inpatient lengths of stay (8.5 days) than other localities (9.1 days). At the same time, losing localities have higher inpatient physician services per admission ($1,216) than other localities ($1,133). Admission rates are not statistically different between losing and other localities. When physician services per enrollee are considered, we find that losing localities have higher outpatient (i.e., out-of-hospital) services per enrollee ($787 versus $584) and total physician services ($1,159 versus $938) than other localities. These patterns generally hold when gaining and losing localities are compared except that gaining localities have lower lengths of stay than losing localities (8.1 versus 8.5 days, respectively).

Taken together these results suggest that with respect to inpatient services, losing localities admit at the same rate, keep patients for shorter stays, but provide significantly more physician services during the inpatient stay. At the same time there does not appear to be a substitution effect whereby losing localities provide fewer physician services outside the hospital. Losing localities provider greater amounts of outpatient physician services and total physician services per enrollee. In short losing localities provider greater amounts of inpatient physician services per admission, outpatient physician service per enrollee, and total physician services per enrollee. The reason that losing localities do not provide statistically greater amounts of inpatient physician services per enrollee is because admission rates, although statically insignificant, are lower in

TABLE IV.4
Access Environment of Variables (a)
Enabling Characteristics--Practice Style, Medicare Market Share, and Medicare Policy

	VARIABLE MEANS				
	All Localities n=230	Gaining Localities n=39	Losing Localities n=51	Non-Losing Localities n=179	t-Test of Means Losing v. Non-Losing (b)
ENABLING--PRACTICE STYLE					
Medicare Utilization Rates					
Age-Sex Adjusted Admission Rate per 1000	311	338	306	313	NS
Casemix-Adjusted Physician Service Per Admission	$1,152	$1,084	$1,216	$1,133	0.03
Adjusted Inpatient Physician Service Per Enrollee	$358	$367	$372	$354	NS
Adjusted Outpatient Physician Service Per Enrollee	$632	$540	$787	$584	<.01
Adjusted Total Physician Service Per Enrollee	$990	$907	$1,159	$938	<.01
Length of Stay	8.98	8.10	8.53	9.13	0.02
ENABLING--MEDICARE MARKET SHARE AND POLICY					
Medicare Market Share					
Percent of Population Insured by Medicare	0.1275	0.1392	0.1214	0.1295	0.04
Medicare Days as Percentage of All Inpatient Days	0.3953	0.4037	0.3789	0.4007	0.04
Medicare Inpatient Discharges as Percentage of All Inpatient Discharges	0.3251	0.3588	0.3100	0.3300	0.01
Medicare Part B Enrollees in HMO's	0.0562	0.0160	0.1006	0.0424	<.01
Medicare Participation/Assignment					
Percentage of Allowed Charges Participating	0.6998	0.6200	0.7363	0.6816	0.02
Percentage of Allowed Charges Non-Participating Assigned	0.1374	0.1706	0.1328	0.1397	NS
Percentage of Allowed Charges Non-Participating Non-Assigned	0.1628	0.2094	0.1309	0.1786	<.01
Percentage of Allowed Charges Participating and Assigned	0.8372	0.7906	0.8691	0.8214	<.01
Medicare Fees Relative to Private Fees					
All Services	0.7580	0.8081	0.6900	0.7791	<.01
Visit Services	0.9251	1.0132	0.8184	0.9581	<.01
Imaging Procedures	0.7070	0.7146	0.6584	0.7221	<.01
Major Procedures	0.5134	0.5144	0.4957	0.5189	<.01
Ambulatory Procedures	0.5199	0.5283	0.5094	0.5232	0.03
Diagnostic Tests	0.4577	0.4546	0.4359	0.4644	<.01

a. See Appendix Table A-1 for data sources and year of variable.

b. Statistical significance is reported (90, 95, and 99 percent confidence). Statistically significant results indicate that variable means for losing localities are statistically different than that for all non-losing localities.

losing localities. (Recall that inpatient physicians services per enrollee is the product of the admission rates and services per admission.)

Thus, physician service utilization rates for beneficiaries in the losing localities are greater than other localities. In many cases these differences are substantial--outpatient physician services per enrollee are nearly 35 percent higher and total physician services are nearly 24 percent higher. Two points with respect to access are relevant. First, utilization rates in the losing localities appear to have historically been well above those in other localities. To the extent that these rates are unjustified (recall that these rates are deflated for prevailing fees as well as age-sex and casemix adjusted), they are part of the reason that these localities lost under the MFS. Second, to the extent that utilization is a proxy for access, beneficiaries in the losing localities have historically enjoyed greater physician access. Even if utilization reductions were to occur in the losing localities, in the near term, utilization is likely to remain above average. Furthermore, if the physician induced demand response is correct, utilization in these localities could actually increase.

Enabling Characteristics--Medicare Market Share and Policy. Table IV.4 also presents characteristics pertaining to Medicare market share and policy. By all three market share measures (Medicare beneficiaries as a percent of the population, Medicare inpatient days and discharges as a percentage of all days and discharges) losing localities have statistically lower Medicare market share than other localities but the differences tend to be small. For example, the percentage of the population enrolled in Medicare is 12 and 13 percent in losing and other localities, respectively. Similarly, losing localities tend to have slightly lower market share than gaining localities.

Turning to Medicare policy differences, losing localities have higher HMO enrollment than other localities. This might seem counter-intuitive; areas with higher HMO enrollment might be expected to have more conservative physician practice styles and thus not experience dramatic reductions under the MFS. However, it is equally plausible that HMOs tend to locate in areas with historically high fee-for-service costs because it enhances their competitive position. HMO enrollment is substantially higher in losing as compared with other localities--10 and 4 percent, respectively. The difference in HMO enrollment between losing and gaining (10 and 2 percent, respectively) localities is greater.

Areas expected to experience large MFS reductions tended to have higher Medicare participation rates. Although the difference in participation rates between losing (74 percent) and other localities (68 percent) is not substantial, it is statistically significant. The difference in participation rates between losing and gaining localities is slightly greater (74 versus 62 percent, respectively). Recall that losing localities are more urbanized and have greater physician supply and specialization--characteristics associated with higher participation rates. Recall that nonparticipating physicians can choose to accept assignment on a service by service basis. We have also calculated both the nonparticipating physician assignment and nonassignment rates. The participation rate can be combined with the assignment rate for nonparticipating physicians to obtain an useful overall assignment rate. Losing localities have statistically higher overall assignment rates (87 percent of charges) than other localities (82 percent). The difference is greater when one compares losing and gaining localities (87 versus 79 percent). Obviously, this overall assignment rate is driven in large part by the participation rate.

These results suggest that losing localities have substantially higher participation rates than all other localities and gaining localities. At the same time, nonparticipating physicians in losing

localities have substantially lower acceptance of assignment (13 percent) than those in other localities (18 percent) and those in winning localities (21 percent). These results suggest a divergence of physician behaviors between losing and other localities. The majority of physicians in losing localities appear to be satisfied with pre-MFS payment rates, and thus participate at rates above those in other localities. However, nonparticipating physicians in losing localities accept assignment at lower rates than physicians in other localities. This may reflect differences in the amount of private demand for specialist services between losing and other localities.

Turning to the fee indices, nationally MFS fees for all physician services are 76 percent of private.[25] We also examine the relationship of MFS fees to private fees varies by type of service. MFS visit fees are 83 percent of private visit fees, while MFS fees for imaging services are 71 percent of comparable private fees. MFS fees for major procedures (51 percent), ambulatory procedures (52 percent), and diagnostic tests (46 percent) are about half those allowed by private insurers.

Although Medicare fees appear to compare unfavorable with private fees overall, it is important to bear in mind that there are several reasons to believe that private fee data are higher than what physicians actually receive. Our private fee data are based on submitted charges. Private insurers employ fee screens to reduce submitted charges and, as discussed in Appendix G, we selected 95 percent of the mean private fee in a locality (rather than the mean fee) to reflect these discounts. Nonetheless, private fee screens are usually based on submitted charges, which gives the physician an incentive to submit high charges in the hopes of raising future fees (Lee

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[25] Using a nine-state database, Pope et al. (1991) compared fees under the model fee schedule to private fees using HIAA data. Medicare fees ranged from 76 percent of private fees in large metropolitan areas to 79 percent in rural areas.

and Hadley 1981). Furthermore, physicians face bad debt as well as administrative costs in pursuing uncollected charges such that the submitted charge does not reflect what is actually received (Cromwell and Burnstein 1985).

MFS fees compare less favorably to private fees in losing localities than in other localities. Overall, MFS fees in losing localities are 69 percent of private fees as compared with 78 percent in other localities and 81 percent in gaining localities. This is also true for each of the type-of-service categories (e.g., visits, imaging), although some of these differences are small. The biggest differences between losing and other localities are for visit services (82 and 96 percent, respectively) and imaging services (66 and 72 percent, respectively). The differences between losing localities and gaining localities for visits (82 and 101 percent, respectively) and imaging (66 and 71 percent, respectively) are even larger.

Medicare fees are also lower than private fees for major procedures, ambulatory procedures, and diagnostic tests in losing localities than in other localities. However, the differences are relatively small; for example, MFS fees for major procedures are 50 percent of private fees in losing localities versus 52 percent in other localities. Probably the greater concern here is that for these three services MFS fees do not compare well with private fees in all localities.

The Medicare market share and policy results suggest several points with respect to access. Localities expected to sustain large reductions under the MFS have lower Medicare market share, which could be considered a warning sign--physicians in these localities may be more able to increase the numbers of non-Medicare patients in their practices. However, the differences in market share between losing localities and other localities are <u>very</u> small. And, as

mentioned above, these losing localities have greater physician supply and specialization, potentially making the Medicare market harder to ignore.

Losing localities have higher participation rates, suggesting that physicians have been satisfied in the past with Medicare payment. High participation rates might also reflect an interest in maintaining Medicare market share. This is encouraging news where access is concerned; reductions in fees may result in some reductions in participation but not necessarily a large-scale exodus from the program by physicians. Even reductions in the participation and assignment rates may not result when one considers that nonparticipating physicians will ultimately only be able to balance bill about 109 percent of the MFS payment amount.[26]

The price indices, however suggest a potential access concern. Two points are relevant. First, we developed price indices for visit, imaging, major procedure, ambulatory procedure, and diagnostic test services. Across all localities, the MFS compares most favorably with private fees for visit (83 percent) and imaging (71 percent) services. The greatest differences between losing and other localities are found for these two services but given the MFS compares well with private fees for those two services in all localities, this is less of a concern. Second, Medicare fees are about half those of private fees for the other three service categories. And although the differences between losing and other localities are not as great, the uniformly lower relative MFS fees could be cause for concern.

[26] Only nonparticipating physicians can balance bill and balance billing limits ultimately will be restricted to 115 percent of the MFS amount. Nonparticipating physicians are paid 95 percent of the MFS amount. Thus balance billing payments are limited to 109 of the MFS amount (1.15 * .95 = 1.09).

C. VARIATION AMONG THE LOSING LOCALITIES

The previous section compared the characteristics of the losing localities with those of other localities to assess the potential for access reductions. The conclusions speak to losing localities as a group and to the potential for systematic differences in access. For example, losing localities have high physician utilization, a characteristic that might mitigate access concerns. It is possible, however, that substantial variation in access characteristics exists among the losing localities. As noted above, although large metropolitan areas tend to experience large fee reductions, several medium and small cities as well as a few rural areas are also among localities experiencing large losses. Using a selected set of the access characteristics, this section examines variations among the losing localities. Tables in Appendix J report the values of the losing localities for each of the characteristics discussed. Table IV.5 summarizes this analysis--in Table IV.5, each of the localities facing large reductions is arrayed by the MFS impact. For each of the nine access characteristics discussed in this section, the locality is ranked as high (H), medium (M), or low (L) depending on whether it falls in the upper quartile, the middle two quartiles, or the lower quartile (respectively) of the distribution of all localities.

With respect to health status and predisposing characteristics, two findings above suggested concern. First, losing localities have substantially higher casemix (national average 1.02; losers' average 1.07). But variation among the losing localities is extreme--casemix ranges from as low as .85 (Monroe, Louisiana) to as high as 1.21 (Las Vegas et al. cities, Nevada). A number of localities have both very high MFS reductions (more than 12 percent) and very high casemix:[27] Las Vegas and Reno et al. cities, Nevada; Fort Lauderdale and North/North Central

[27] A Medicare fee reduction of 12 percent per service is twice the national average estimated in HHS' regulatory impact analysis.

TABLE IV.5
Summary of Access Characteristics for Localities Experiencing Disproportionate Losses

Losing Localities	MFS Impact (a)	Medicare Inpatient Physician Service Casemix	Percent Non-White Elderly	Per Capita Income	Percentage of Population Uninsured	Patient Care Physicians Per 1000	Adjusted Total Physician Service per Enrollee	Percentage of Population Insured with Medicare	Percentage of Allowed Charges Participating	Physician Fee Index
MANHATTAN, NY	-0.25	M	H	H	M	H	M	M	M	L
LAS VEGAS,ET AL(CITIES),NV	-0.23	H	M	H	M	M	H	L	H	L
MIAMI, FL	-0.23	M	M	M	H	H	H	M	H	L
FORT LAUDERDALE, FL	-0.19	H	M	H	M	M	H	H	M	L
ALASKA	-0.19	L	H	H	H	M	H	L	M	M
SAN DIEGO/IMPERIAL, CA	-0.17	H	M	M	M	M	H	L	M	L
LOS ANGELES, CA (1ST OF 8)	-0.17	M	H	H	H	H	H	L	H	L
LOS ANGELES, CA (2ND OF 8)	-0.17	M	H	H	H	H	H	L	H	L
LOS ANGELES, CA (3RD OF 8)	-0.17	M	H	H	H	H	H	L	H	L
LOS ANGELES, CA (4TH OF 8)	-0.17	M	H	H	H	H	H	L	H	L
LOS ANGELES, CA (5TH OF 8)	-0.17	M	H	H	H	H	H	L	M	L
LOS ANGELES, CA (6TH OF 8)	-0.17	M	H	H	H	H	H	L	H	L
LOS ANGELES, CA (7TH OF 8)	-0.17	M	H	H	H	H	H	L	H	L
LOS ANGELES, CA (8TH OF 8)	-0.17	M	H	H	H	H	H	L	H	L
RIVERSIDE, CA	-0.19	H	M	M	M	L	M	M	M	L
DALLAS, TX	-0.17	H	H	H	H	M	H	L	M	L
SANTA BARBARA, CA	-0.17	H	M	H	M	M	M	M	L	L
VENTURA, CA	-0.19	H	M	H	M	M	H	L	H	L
SAN BERNARDINO/E.CENTRAL CA	-0.16	M	M	M	H	M	M	L	H	L
HOUSTON, TX	-0.16	M	H	M	H	H	H	L	M	L
FLAGSTAFF (CITY), AZ	-0.15	M	H	L	M	M	M	L	M	L
HAWAII	-0.15	H	H	M	L	M	L	L	M	L
SAN ANTONIO, TX	-0.15	M	M	L	H	M	H	L	M	M
BAKERSFIELD, CA	-0.15	H	M	M	M	M	H	L	H	L
SOUTHEAST RURAL TEXAS	-0.15	M	M	L	H	L	H	M	M	M
N/NC FLORIDA CITIES	-0.15	H	M	M	M	M	H	H	M	M
RENO, ET AL (CITIES), NV	-0.15	H	M	H	H	M	H	L	H	M

TABLE IV.5 (cont.)
Summary of Access Characteristics for Localities Experiencing Disproportionate Losses

Losing Localities	MFS Impact (a)	Medicare Inpatient Physician Service Casemix	Percent White Elderly	Per Capita Income	Percentage of Population Uninsured	Patient Care Physicians Per 1000	Adjusted Total Physician Service per Enrollee	Percentage of Population Insured with Medicare	Percentage of Allowed Charges Participating	Physician Fee Index
STOCKTON/SURR. CNTYS, CA	-0.14	H	M	M	M	M	M	M	M	M
PHOENIX, AZ	-0.14	H	M	M	M	M	M	M	M	L
FRESNO/MADERA, CA	-0.13	H	H	M	H	M	M	M	M	M
ANAHEIM-SANTA ANA, CA	-0.13	M	M	H	H	M	H	L	M	L
VICTORIA, TX	-0.12	L	M	M	H	M	H	M	M	H
BIRMINGHAM, AL	-0.12	M	H	M	M	H	M	H	H	M
MONROE, LA	-0.12	L	H	L	M	M	H	M	M	M
TUCSON (CITY), AZ	-0.12	M	M	M	H	H	M	M	H	L
REST OF FLORIDA	-0.12	H	M	L	H	L	H	H	M	M
SMALL GA CITIES 02	-0.12	M	H	M	M	H	M	M	M	M
WESTERN RURAL TEXAS	-0.12	M	M	L	H	L	M	M	M	M
BALTIMORE/SURR. CNTYS, MD	-0.12	L	H	H	L	H	M	M	H	L
MERCED/SURR. CNTYS, CA	-0.12	H	M	M	M	M	M	M	M	M
CLEVELAND, OH	-0.12	M	M	H	L	H	M	H	H	M
ALEXANDRIA, LA	-0.11	L	H	L	H	M	H	M	H	M
KINGS/TULARE, CA	-0.11	M	M	L	M	L	M	L	M	M
CORPUS CHRISTI, TX	-0.11	M	M	L	H	M	H	L	M	L
COLUMBUS, OH	-0.11	M	M	M	M	H	M	L	H	M
SHREVEPORT, LA	-0.10	M	H	L	H	H	M	M	M	M
SACRAMENTO/SURR. CNTYS, CA	-0.10	H	M	M	M	M	M	M	H	M
NE RURAL CA	-0.10	H	M	M	M	M	M	H	M	M
NEW ORLEANS, LA	-0.10	M	H	M	H	H	H	M	H	M
SUBURBAN KANSAS CITY, KS	-0.10	H	L	H	L	H	M	L	H	H
PHILLY/PITT MED SCHS/HOSPS	-0.10	L	H	M	L	H	H	H	H	L

a. MFS impact is percentage gain/loss in payments per service assuming the Medicare Fee Schedule is fully implemented in 1992.

Florida Cities, Florida; Phoenix, Arizona; and Santa Barbara, Riverside, Bakersfield, Stockton, Fresno/Madera, Ventura, and San Diego/Imperial, California; Dallas, Texas; and the state of Hawaii. Second, losing localities also have higher proportions of minority beneficiaries (14 percent compared to the national average of 11 percent). We concluded above that access for this population might be a concern and should be monitored. Hawaii; Manhattan, New York; Flagstaff, Arizona; Alaska; Dallas and Houston, Texas; and Los Angeles (all eight localities), and Fresno/Madera, California have high proportions of minorities and face very high fee reductions.

Losing localities have two contradictory characteristics--higher per capita incomes ($18,384 as compared to $17,632 nationally) but greater proportions of the uninsured (18 percent as compared to 14 percent nationally). Higher incomes should reduce the concern that Medicare beneficiaries will be denied access. However, the range of incomes among losing localities is wide--from 68 percent of the national average in Flagstaff, Arizona to nearly 200 percent of the national average in Manhattan, New York. Three localities face very high fee reductions and have low per capita incomes: Flagstaff, Arizona; Southeast Rural and San Antonio, Texas. Large uninsured populations suggest that the locality may already be facing access problems and that the health care delivery system is under stress.[28] Several localities expected to sustain very large MFS reductions also have high numbers of the uninsured: Alaska; Reno et al. Cities, Nevada; Dallas, Houston, San Antonio, and Southeast Rural, Texas; Los Angeles, San Bernadino/E. Central, Fresno/Madera and Anaheim-Santa Ana, California; and Miami, Florida.

Losing localities have two complementary characteristics that should mitigate concerns for reduced access. Losing localities have greater physician supplies (2.17 per 1000 compared to

[28] We also pointed out above that higher proportions of the uninsured could reduce physicians' willingness to deny access to Medicare beneficiaries even in the face a reduced fee.

1.90 nationally) and very high Medicare physician utilization ($1,159 per enrollee as compared to $990 nationally). Greater physician supply should reduce the likelihood of reduced access because physicians are presumably under greater pressure to maintain market share. Nonetheless, physician supply varies widely among the losing localities from .57 per 1000 in Western Rural Texas to 7.93 in Manhattan, New York. Southeast Rural Texas and Riverside, California face very high fee reductions and have low physician supplies. The majority of losing localities have physician service use rates substantially above the national average, but only the state of Hawaii has a lower than average physician use rate coupled with a very large fee reduction.

Above we found that losing localities have only slightly lower Medicare market share (12 percent) than other localities (13 percent) suggesting that access may not be a concern. But there are extreme variations in market share among the losing localities. Among losing localities the percentage of the population covered by Medicare can be as low as 4 and 7 percent in Alaska and Houston, Texas or as high as 20 and 21 percent in two Florida localities, (Rest of Florida and Fort Lauderdale). Several localities could be considered as potential access concerns because they have low market shares while expecting very high fee reductions: Alaska; Houston, Dallas, and San Antonio, Texas; Reno and Las Vegas et al. (cities), Nevada; Flagstaff, Arizona; Los Angeles, Anaheim-Santa Ana, San Diego/Imperial, San Bernardino/E. Central, Ventura and Bakersfield, California; and Hawaii.[29]

Greater concern for access might be raised in localities with lower participation rates. Low participation rates suggest that physicians are less satisfied with Medicare-allowed amounts and that there may be greater private demand for their services. Losing localities have higher

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[29] It is noteworthy that many of these localities have high proportions of the Medicaid insured and the uninsured, which may mean that the Medicare market is still attractive.

participation rates (74 percent) than the national average (70 percent) or other localities (68 percent), suggesting that access may not be a concern. Only one losing localities faces a very high fee reduction with a low participation rate--Santa Barbara, California.[30]

Nationally the MFS fee is approximately 76 percent of private fees. MFS fees are 69 percent of private fees in losing localities, suggesting a greater access concern in these localities. Considerable variation is found among the losing localities. In Manhattan, New York, and Miami, Florida, the MFS pays between 55 and 56 percent of private fees; whereas Medicare fees are 80 percent or more of private fees in Columbus, Ohio; Alexandria, Louisiana; Suburban Kansas City, Kansas; and Victoria and Western Rural Texas. Given the empirical findings in the literature regarding relative fees, low relative fees raise a great degree of concern. Several localities expecting very large fee reductions have low relative MFS fees. In California these localities include Los Angeles, Anaheim-Santa Ana, San Diego/Imperial, Santa Barbara, San Bernardino/ E. Central, Riverside, Ventura, and Bakersfield. Other localities include Houston and Dallas, Texas; Miami and Fort Lauderdale, Florida; Las Vegas et al. (cities), Nevada; Phoenix and Flagstaff, Arizona; Manhattan, New York; and Hawaii.

D. IMPLICATIONS

To assure access, Medicare must set the "right" price for each service and for each area. If the wrong price is set for a service, physicians could choose to provide more or less of that service in every locality. If the wrong price is set in an area, services to beneficiaries in that locality could be affected. Prices can be set too high or too low, but access is threatened only

[30] Table IV.5 indicates that Santa Barbara is in the upper quartile with respect to income. The lower participation rate in this locality may reflect the ability and willingness of beneficiaries to pay balance billing amounts.

when the price is set too low. For this reason we focus on losing localities and determine whether there are characteristics of the losing localities that would suggest systematic denial of access. Losing localities tend to be larger metropolitan areas (e.g., Manhattan, Los Angeles), however a number of medium and small metropolitan areas (Phoenix, Shreveport, Bakersfield) as well as a few rural areas (e.g., rural Florida) also experience large reductions in payments. We also find substantial variation in the access characteristics among the losing localities suggesting that generalizations regarding the losing localities are tentative and should be treated with caution.

The above analysis of the access environment in Medicare payment localities presents a mixed picture. Losing localities are significantly different from other localities on a number of dimensions, some suggesting that access could become a concern, some suggesting that access is unlikely to be affected. Much of the impact depends on the response of physicians and beneficiaries to fee reductions, about which we know very little with any empirical certainty. Will physicians facing price reductions respond by providing more services or fewer services to the Medicare population? Or will they respond by restructuring their practices toward the private market? If physicians wish to induce demand among Medicare patients or decrease the proportion of Medicare patients in their practices, how much flexibility do they have? Similarly, will beneficiaries respond to lower prices by demanding more services?

When viewing access variable averages across locality groups, a number of losing locality characteristics might raise concern. These localities have higher Medicare inpatient case complexity. They have greater proportions of minorities, who historically have lower utilization rates. Losing localities have greater proportions of the uninsured, suggesting health care delivery systems under stress. Losing localities have greater degrees of physician specialization--

specialists sustain greater reductions under the MFS and certain specialists may have greater ability to move to the private market. Finally, and perhaps most importantly, the ratio of Medicare fees to private fees is lower in these localities. At the same time losing localities have a number of characteristics that mitigate the concern that Medicare beneficiaries will have insufficient access. Health status measures are generally better and there are lower proportions of the disabled and the very old. Personal income is higher in losing localities, suggesting greater ability to meet deductibles, copayments, and balance billing amounts, and to purchase additional insurance. Losing localities have greater physician supply and only slightly lower market share, suggesting that physicians' ability to leave the Medicare market entirely may be limited. Perhaps most importantly, these localities have much higher utilization and have historically had substantially greater participation rates. These last two points suggest that even if reductions in use occur, Medicare beneficiaries in these localities are likely to receive services at or above the national average, and that physicians in losing localities have historically been satisfied with Medicare reimbursement.

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V. CONCLUSIONS[1]

The preceding chapter of this report indicates that by 1996 over one-fifth of the Medicare pricing localities are expected to experience reductions in payments per service of at least 10 percent relative to CPR methods as a result of the introduction of MFS.[2] In theory, if MFS, on average, sets the "right" price, then access differentials across localities should not develop.[3] In this context "right" implies that the geographic adjusters set fees at a level that elicits an adequate service supply relative to patient demand. However, if the reductions in payments per service are due to errors in the OGPCI (or the work or malpractice component of the GPCIs not analyzed here) or if there were other justifiable factors that could have been legitimately used as adjusters, then the changes in payments per service may be seen as arbitrary, inequitable, and a potential cause of access problems.

The evidence from the various empirical studies undertaken in this project suggests that major concerns related to the accuracy of the OGPCI or serious flaws in the elements of the geographic adjusters are probably not warranted. Chapter III showed that the geographic adjusters used in MFS are reasonably well correlated with physicians' actual expenses per unit of input. This suggests that there does not appear to be a systematic bias in the adjusters as a result of using proxy price data as opposed to data on the actual prices physicians face. The one exception to this may be in the area of equipment, supplies and other expenses--which accounts

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[1]This chapter was written by Stephen Zuckerman and Mark Miller.

[2]Despite this simulated reduction in payment rates relative to CPR, HCFA estimates total payments to grow during the MFS transition. Of course, the extent of that estimated growth depends on assumptions about payment updates, volume and intensity growth, and changes in numbers of beneficiaries. Actual growth in total payments or reductions in payments per service could deviate from simulated values if, for example, deficit concerns lead to new cost-containment policies.

[3]However, within locality variation in practice costs or baseline access could lead to intra-locality access problems.

for about 13 percent of practice revenues--whose actual prices varied geographically but were assumed to be constant across areas in the OGPCI.

The analysis of fee variation prior to MFS (Chapter II) found that, beyond the GPCI, there were not variables that affected fees and were reasonable candidates to be used as geographic adjusters. We did find that Medicare fees were higher in areas with higher private fees. Moreover, our assessment of environmental factors related to access (Chapter IV) shows that having low Medicare fees relative to the private market is an attribute of localities experiencing the largest losses. This might suggest that the MFS should reflect, at least in part, private market fees. However, if Medicare policymakers believe that a major goal of the MFS should be to correct geographic inequities in physician charging patterns, then it seems highly unlikely that the level of private fees would be used as a geographic adjuster. In addition, relying on the private market to set Medicare fees would forsake Medicare's significant market share and its ability to act as a price setter. Even if policymakers were inclined to increase payments in localities that were relatively disadvantaged in terms of Medicare's relation to private fees, all of the losing localities would not be helped.

Despite this evidence regarding the OGPCI and the historical determinants of Medicare prices and the fact that these analyses suggest little in the way of obvious refinements in the MFS, it remains that there are many localities whose fees will have fallen dramatically relative to CPR by the time the MFS is fully implemented. If policymakers sense that these payment rate reductions are too large, either on equity grounds or due to access concerns, some remedies may be sought. These remedies could include changing the geographic practice cost adjustors or incorporating some type of access "protectors." The basic role of these access "protectors" would be to stop payment rates from falling by as much as they will in some of the losing localities.

The most obvious way to reduce the ultimate impact of the MFS in losing localities would be to stop the fully implemented MFS from ever going into effect. Of course, slowing the implementation of MFS would probably only be considered if there were clear evidence that access problems were being created. Essentially, this amounts to freezing the transition so that payments for the most adversely affected services would continue to reflect some portion of an area's historical payment base. Keep in mind that an across-the-board halt in the transition would also reduce the fee increases in areas that are projected to gain under MFS relative to CPR. If this were done before 1994, OACT simulations indicate that the impact of the MFS will be reduced by about 40 percent in localities experiencing the largest projected losses. The reduction in impact would be smaller the later into the five-year transition that it was stopped.[4]

It is more difficult to assess the effects of changing the geographic practice cost adjusters. A given type of change in one of the GPCIs, e.g., updating the rental index, will alter OGPCI values differentially across localities. In addition, the effect of changes in the work GPCI will differ from changes in the overhead GPCI according to the distribution of services in the locality. For these reasons, the effectiveness of changes in the geographic adjustors on reducing the adverse impact of the MFS can only be determined through simulation. The results of several alternative approaches to deriving the geographic adjustors are discussed in the following section.

[4]Moreover, slowing the transition could be ineffective if policymakers wait for evidence showing that access had become or was on the verge of becoming a serious problem before considering the policy.

A. IMPACT OF SOME ALTERNATIVE APPROACHES TO GEOGRAPHIC ADJUSTMENT

We use a simulation model, previously developed (Miller and Zuckerman, 1992) and briefly described in Appendix K, to explore the effect of three specific changes in the GPCIs. First, we replace the legislated work GPCI that reflects only one-quarter of the variation in physicians' time costs with one that reflects 100 percent of the variation (Welch, Zuckerman and Pope, 1989). Although this report has focused on the accuracy of the overhead GPCI, we present a simulation of a changes in the work GPCI because of the number of large, high-cost urban areas among the localities incurring the largest losses. Second, we modify the OGPCI by using an updated rental index based on data from 1988, 1989, and 1990. Given the small impact this change had on the rental index values, it seems unlikely that this will have much of an effect on the impact of MFS. Third, we introduce an adjuster for other overhead expenses (equipment, supplies, and "other") based on a simple average of the current wage and rental indices. Although this is an ad hoc approach, it at least provides a sense of how relaxing the assumption that the prices for these inputs are constant across localities would alter the MFS effects.

The results of these simulations are presented in Table V.1 for the localities losing the most under MFS. The first column shows the full impact of the MFS on Medicare payments per service. These numbers are the baseline against which we simulate the effect of alternative GPCIs. This baseline was derived from simulations performed by the HCFA actuaries. The remaining columns show our estimate of the change in the actuaries' full MFS impact resulting from the geographic adjustors described above. A positive entry implies that the adverse impact of the MFS would be reduced, while a negative entry signifies an increased reduction in payments per service. Due to the spending neutrality likely to be required of any changes in the

TABLE VI.1

Locality Level Simulation of MFS Impacts on Payments Per Service Using Some Alternative Geographic Adjusters

Carrier	Locality	Name	Full MFS Impact (OACT)	Change in MFS Impact 100% Work	Change in MFS Impact FMR Update	Change in MFS Impact Oth OH Adj
803	1	Manhattan, NY	-25.00%	6.29%	0.33%	2.40%
590	4	Miami, FL	-23.00%	4.07%	0.11%	0.30%
1290	1	Las Vegas et al (Cities), NV	-23.00%	4.26%	-0.08%	0.99%
1020	1	Alaska	-19.00%	12.45%	-1.01%	2.09%
590	3	Fort Lauderdale, FL	-19.00%	-0.94%	0.26%	-0.17%
2050	28	San Diego/Imperial, CA	-18.00%	3.20%	-0.19%	1.10%
2050	22	Los Angeles, CA (5th of 8)	-17.00%	6.03%	0.11%	1.54%
2050	25	Los Angeles, CA (8th of 8)	-17.00%	4.91%	0.09%	1.26%
2050	19	Los Angeles, CA (2nd of 8)	-17.00%	8.31%	0.15%	2.08%
2050	23	Los Angeles, CA (6th of 8)	-17.00%	8.04%	0.14%	2.01%
2050	21	Los Angeles, CA (4th of 8)	-17.00%	10.06%	0.18%	2.55%
2050	20	Los Angeles, CA (3rd of 8)	-17.00%	6.55%	0.12%	1.69%
2050	18	Los Angeles, CA (1st of 8)	-17.00%	9.28%	0.16%	2.30%
2050	24	Los Angeles, CA (7th of 8)	-17.00%	8.18%	0.14%	2.01%
542	27	Riverside, CA	-17.00%	3.39%	0.11%	0.88%
900	11	Dallas, TX	-17.00%	-0.63%	1.98%	-0.53%
2050	17	Ventura, CA	-17.00%	4.17%	0.15%	1.49%
2050	16	Santa Barbara, CA	-17.00%	1.36%	-0.12%	0.90%
1120	1	Hawaii	-16.00%	0.43%	1.57%	1.20%
1030	5	Flagstaff (City), AZ	-16.00%	-2.37%	-0.12%	-1.10%
542	15	San Bernardino/E. Central CA	-16.00%	3.63%	0.12%	0.95%
900	18	Houston, TX	-16.00%	2.17%	0.18%	-0.46%
590	2	N/NC Florida Cities	-15.00%	-4.10%	-0.00%	-1.00%
1290	2	Reno, et al (Cities), NV	-15.00%	1.18%	-0.14%	1.99%
900	3	Southeast Rural Texas	-15.00%	-4.22%	-0.09%	-1.59%
900	7	San Antonio, TX	-15.00%	-4.18%	0.82%	-0.95%
542	14	Bakersfield, CA	-15.00%	3.53%	-0.12%	0.59%
1030	1	Phoenix (City), AZ	-14.00%	0.45%	-1.01%	0.39%
542	8	Stockton/Surr. Cntys, CA	-14.00%	2.99%	-0.10%	0.34%
2050	26	Anaheim-Santa Ana, CA	-13.00%	5.72%	0.18%	2.30%
542	11	Fresno/Madera, CA	-13.00%	0.81%	-0.08%	0.13%
1040	2	Small GA Cities 02	-12.00%	-6.69%	-0.32%	-1.71%
528	5	Monroe, LA	-12.00%	-3.23%	-0.27%	-1.69%
900	32	Victoria, TX	-12.00%	-3.90%	-0.34%	-0.17%
1030	2	Tucson (City), AZ	-12.00%	-2.13%	-0.10%	0.00%
900	4	Western Rural Texas	-12.00%	-6.63%	-0.26%	-2.44%
16360	3	Cleveland, OH	-12.00%	2.04%	0.49%	-0.71%
590	1	Rural Florida	-12.00%	-5.78%	0.16%	-2.09%
542	10	Merced/Surr. Cntys, CA	-12.00%	2.75%	-0.14%	0.19%
690	1	Baltimore/Surr. Cntys, MD	-12.00%	4.11%	0.00%	0.45%
510	5	Birmingham, AL	-12.00%	-3.79%	-0.06%	-1.68%
900	24	Corpus Christi, TX	-11.00%	-3.90%	-0.29%	-0.77%
542	13	Kings/Tulare, CA	-11.00%	-0.14%	-0.12%	0.08%
16360	4	Columbus, OH	-11.00%	-3.12%	-0.22%	-0.82%
528	7	Alexandria, LA	-11.00%	-3.27%	-0.41%	-2.37%
865	1	Philly/Pitt Med Schs/Hosps, PA	-10.00%	2.42%	0.00%	0.14%
542	2	NE Rural CA	-10.00%	0.19%	-0.11%	-0.17%
542	4	Sacramento/Surr. Cntys, CA	-10.00%	3.80%	-0.09%	1.09%
528	2	Shreveport, LA	-10.00%	0.57%	-0.33%	-1.06%
740	4	Suburban Kansas City, KS	-10.00%	-3.46%	-0.51%	-0.56%
528	1	New Orleans, LA	-10.00%	-1.17%	-1.09%	0.06%

(Notes: 1996 Impact Assumes Full MFS)

geographic adjusters, the reader should be aware that the impact of the MFS in other localities would also change. It might be the case that some small losses or gains would be altered or that some large gains in some localities could be reduced. The impact of these GPCI changes are based on the simulation model developed for this study and scaled to be consistent with the actuaries' results.[4]

Column 2 shows that moving to a 100 percent work GPCI would lessen the adverse impact of the MFS in 32 of the 51 largest losers. Alaska would gain the most by moving away from the 1/4 work GPCI; its 19 percent loss would be reduced by 12.5 percentage points to about 6.5 percent. Other localities that would gain more than 5 percentage points are Manhattan, NY, Los Angeles,CA (selected localities), and Anaheim-Santa Ana, CA. However, because not all losing localities have work GPCI values over 1.0, moving to 100 percent work would reduce payments in some areas. For example, in Small Cities Georgia 02, the 1/4 work GPCI of .962 would fall to .846 under a 100 percent work adjustment, causing the adverse impact of the MFS to increase by 6.7 percentage points. The ultimate impact of the MFS in this locality would increase from a 12 percent reduction in payments per service to almost a 19 percent reduction.

The two changes in the OGPCI that we simulated altered the impact of the MFS to a much smaller degree than the 100 percent work adjustment. Updating the rental index to an index based on the average of three more recent years of data (column 3) results in no more than a two percentage point change in any of these losing localities. The two localities that would gain the most are Dallas, TX (1.98 percentage points) and Hawaii (1.57 percentage points). Only two localities--Alaska and Phoenix, AZ--lose as much as 1 percentage point. These effects are

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[4]The actuaries' simulation model yielded a somewhat larger reduction in payment per service overall as well as within the set of localities experiencing the largest losses.

consistent with the small changes in the rental index values. The ad hoc adjustment to the other overhead component of the OGPCI (column 4) has a slightly larger effect than the rental update, but the largest changes are still less than 3 percentage points. Not surprisingly, the areas that benefit most from a 100 percent work adjustment tend to benefit from this ad hoc adjustment for other overhead. The reason for this is that one-half of the ad hoc adjustment reflects variation in wages and is highly correlated with the index of physician time costs, also an index of wages.

B. IMPLICATIONS

These simulations show that revisions in the geographic practice cost adjustors are unlikely to benefit all areas experiencing large losses under the MFS. The search for a mechanism that would reduce the adverse impact of the MFS is only critical, however, if there is evidence that payment reductions are impeding access. Given the characteristics of these areas (Chapter IV), there is not clear cut evidence that the large reductions in payments per service would necessarily lead to access problems. It is virtually impossible to predict where access problems will develop. However, it seems reasonable only to deviate from the current MFS policy if access is actually threatened.

Stopping the transition in the largest losing localities, would soften the impact of MFS. Of course, given the broad consensus around the acceptability of the MFS, modifications in the transition are only likely to be considered if access problems arise or seem imminent. It would be a direct way to modify the MFS rules that will uniformly help all losing localities. Halting the transition affects fees on a service-by-service basis. Only those fees that are to be cut the most relative to CPR, i.e., those that had historically high charges relative to the MFS, would be raised. In this sense, the redistribution toward the largest losing localities would be targeted at

those services that are more likely to see their supplies reduced. A major drawback of stopping the transition is that it would reduce the size of projected gains in many localities, assuming it is implemented so as to not increase program costs.

Anytime prices are reduced to the extent they are under the MFS in certain localities, there is the potential for a cutback in service supply. Even if total supply remains constant, lower prices could encourage greater patient demand that, if unmet, could be interpreted as a deterioration in access. Obviously, it is too soon after the implementation of the MFS to determine if access will or will not be affected. Although this report has not identified serious problems related to the OGPCI adjustment or to the need for other types of geographic adjustors, it has shown that some areas will experience significant payment rate reductions. HCFA can and will be monitoring changes in access through an annual serious of reports. The first of these reports was released in April 1992. This report lays out the issue and HCFA's approach to studying it. Should the conclusion be reached that a policy change is required, some of the options discussed above could be considered.

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APPENDIX A

PHYSICIAN FEE DETERMINANTS IN THE LITERATURE

This appendix enumerates factors from both the refereed and non-refereed literature that may be related to variation in physician fees. The following table lists factors that have been hypothesized to affect physician fees, summarizes the empirical literature's findings with respect to these factors' relationship to fees, and cites studies that explore a given factor. The factors are classified into the following categories: supply factors, demand factors, general market characteristics, physician personal and practice characteristics, carrier practices, and hospital characteristics. This classification of factors does not necessarily correspond to the authors' classification.

Two categories of fee determinants are not included in this summary table. First, the table does not include some factors that have been hypothesized in the literature to affect fee levels, but which would not affect geographic variation in fees. Examples of factors in this category are general price controls (e.g., Holahan and Scanlon 1978) and the Medicare Economic Index (e.g., Paringer 1981). Paringer specifically notes that the impact of the MEI does not vary across regions or specialties for the same procedures. A similar argument can be made about the effects of the Prospective Payment System (Fisher 1987).

Second, the table does not include characteristics of private insurers that should only affect private fee levels. Sloan (1981), for example, examines in detail characteristics of Blue Shield plans and their effects on Blue Shield payment levels. An example of a Blue Shield plan characteristic in Sloan (1981) is the extent of physician control, measured by the extent of physician involvement in selecting plan board members.

The table summarizes the literature's dominant empirical results on the relationship between a factor and physician fees. The results fall into one of four categories. First, "positive" indicates that the factor is generally found to be positively and significantly related to physician fees. Second, "negative" indicates that the factor is generally found to be negatively and significantly related to physician fees. Third, "mixed" indicates that a somewhat equal number of studies found a significant positive relationship and a significant negative relationship. Mixed results may also be reported when a single reference is cited. In this case, the reference estimates several models and reports mixed results for the specified factor across those equations. Finally, "insignificant" indicates that the factor was not generally found to be significantly related to fee levels.

There are two issues to consider in interpreting the table's summary of the relationship between a given factor and physician fee levels. The first issue is the substantial variation in the number of studies upon which a summary result is based. For example, twelve studies include consumer income as a demand factor. In contrast, only one study examines the relationship between carrier practices and fee levels. In general, greater confidence may be attributed to a summary result based upon a relatively larger number of studies. The level of confidence attributable to a result based upon a small number of studies depends upon their methodological soundness.

Correspondingly, the second issue to consider in interpreting the table is methodological limitations or problems that may confound a study's empirical results. For example, published comments on Pauly's (1981) analysis of the effects of hospital characteristics on fee levels note significant data problems in the estimation of the price equation (Dyckman 1981 and Hornbrook 1981). In addition, though the empirical literature fairly consistently finds the cost of practice

inputs to be significantly related to physician fee levels, several studies (e.g., Muller et al. 1979 and Redisch et al. 1981) do not include it as a potential fee determinant. Neither do these studies include other correlates or proxies for practice costs.

The results of studies with potentially significant methodological limitations are discounted in the summary result for a factor. For example, both Hsiao et al. (1986) and Muller et al. (1979) include mortality rates as a proxy for health status in their analyses of physician fees. Muller's omission of practice costs or a reasonable proxy is considered a potentially significant methodological limitation. Consequently, Muller's result is discounted. The reported summary result of a negative relationship between mortality rates and fee levels is based primarily upon Hsiao.

The list of references includes methodological notes. The notes indicate whether a study omits a key variable (practice costs), and other potential methodological problems (e.g., multicollinearity) identified in the study or by commentators. In addition, if a subset of results from a study is used in summarizing the relationship between a factor and physician fees, that fact is noted in the list of references. For example, Sloan (1982) estimates equations for visit fees and equations for specific procedure fees. The table only uses the results for the equations for visit fees. Studies that use simple descriptive statistics rather than multivariate analysis and those that analyze Medicare charge data are also noted.

It should be noted that the table identifies neither those results that are inconsistent with theoretical or common sense expectations nor possible reasons for inconsistency across studies. The possible reasons for such inconsistencies range from differences in model specification to the unit of analysis. For example, whether the unit of analysis is an individual physician's patients or the county population may significantly affect the sign or significance of empirical results of

studies which include consumer demand factors. A complete analysis of such inconsistencies is beyond the scope of this project.

TABLE A-1

FACTORS HYPOTHESIZED TO AFFECT PHYSICIAN FEE LEVELS

FACTORS	RELATIONSHIP TO FEE LEVELS	REFERENCES
SUPPLY FACTORS		
Input Costs		
Malpractice expense, e.g, average malpractice premiums	Positive	[7], [14]
Medical Office Rents	Positive	[14]
Non-physician labor costs and capital costs	Positive	See following references for specific alternative cost measures
Average wage for production workers	Positive	[12]
Average costs per practice employee	Positive	[7], [11], [12], [15], [16]
Retail wage rates	Insignificant	[3], [11]
Local wage rates	Negative	[2]
Labor and capital expense	Positive	[6]
Cost-of-living index, Consumer Price Index	Positive	[6]
Hospital wage rates	Positive	[14]
Practice Style		
Proportion of physician's time spent in hospital vs. medical office	See note (a)	[1], [18]

hpw6197 task1 appendix table determinants

Table A-1 (continued)
Page 2

FACTORS	RELATIONSHIP TO FEE LEVELS	REFERENCES
Number of patients seen by physicians in other settings, e.g., emergency rooms, nursing homes, clinics, patients' homes	See note (a)	[1]
Total hours worked by all aides	See note (a)	[1]
Number of nonphysician employees per physician	See note (a)	[1]
Total time spent on administrative matters; other professional activities	See note (a)	[1]
Number of clerical workers employed in medical office	Positive	[4]
Patient visits per hour	Negative	[4]
CONSUMER DEMAND FACTORS		
Health Status Measures		
Bed-disability days	Positive	[3]
Mortality rates	Negative	[6], [10]
Socio-Demographic Measures		
Age distribution, e.g., percent over 65 years, percent under 5 years	Significant [see note (c)]	[2], [3], [6], [11], [12], [16]
Race, e.g., percent black, percent minority	Mixed	[2], [3], [11], [12]
Education, e.g., median years of school completed	Insignificant	[2], [3], [4], [12]
Income, e.g, median area income per capita	Positive	[2], [3], [6], [10], [11], [12], [14], [15], [16], [18]
Percent of population under poverty level	Positive	[2], [6]
AFDC population, e.g., AFDC recipients as percent of area population	Insignificant	[6], [11]
Sex, e.g., percent female	Insignificant	[2]

Table A-1 (continued)
Page 3

FACTORS	RELATIONSHIP TO FEE LEVELS	REFERENCES
Economic Measures		
Employment rates	Negative	[3]
Unemployment rates	Positive	[2], [6]
Percent of workforce that are laborers	Insignificant	[2]
Percent of total employment in agriculture	Insignificant	[11], [15]
Percent of labor force who are professional	Negative	[3]
Percent of labor force who are clerical	Negative	[3]
Percent of labor force who are blue collar	Negative	[3]
Public sector payments for medical care, i.e., Medical Assistance payments per capita, Medicare Part B payments per capita, physician payments to area	Insignificant	[2]
Volume of public and private health insurance payments to area	Insignificant	[8]
Unionization rates, union participation	Positive	[6], [11]
Consumer Information about Providers		
Physician density, physicians per square mile	Positive	[12]
Population density, population per square mile	Positive	[2], [8], [12], [14]
Area stability, i.e., percent of population that moved into housing unit during past 5 years	Positive	[11], [12]
Percent of households with female head	Positive	[11], [12]
Local Insurance Market Characteristics		
Various payors' fee schedules	Positive	[7], [14], [16]
Percent of patients/population with private health insurance coverage	Positive	[14]

Table A-1 (continued)
Page 4

FACTORS	RELATIONSHIP TO FEE LEVELS	REFERENCES
Percent of population with Medicare coverage	Positive	[11], [14]
Percent of population with Medicaid coverage	Negative	[11], [14], [17]
Percent of population with major medical insurance	Positive	[16]
Percent of population without insurance	Insignificant	[11], [13]
Percent of population with public or private insurance	Positive	[6]
Average coinsurance rate for hospital services	Positive	[3]
Physicians' Blue Shield participation rates	Negative	[2]
Participation in Medicare assignment, Medicaid	Negative	[7]
Percent of physician's practice not reimbursed based upon usual, customary, reasonable (UCR) method	Negative	[18]
GENERAL MARKET CHARACTERISTICS		
Physician-to-population ratio	Mixed	[2], [3], [6], [7], [8], [10], [11], [12], [13], [14], [16], [17]
Urban (versus rural) area, percent of population in urban area	Positive	[2], [3], [10], [17]
PHYSICIAN PERSONAL AND PRACTICE CHARACTERISTICS		
Personal Characteristics		
Specialty	Significant [see note (a)]	[2], [4], [6], [7], [8], [11], [12], [13], [15], [16], [17],

FACTORS	RELATIONSHIP TO FEE LEVELS	REFERENCES
Physician's age or experience (linear)	Negative	[2], [4], [6], [7], [8], [11], [13], [14], [16], [17], [18]
Physician's sex	Insignificant	[14]
Board certification	Insignificant	[2], [6], [8], [11], [13], [14], [15], [16], [17], [18]
Foreign medical graduate	Insignificant	[7], [8], [13], [14], [15], [17], [18]
Faculty appointment	Insignificant	[13], [16]
Medical school affiliation	Positive	[14]
Medical (versus Osteopathic) doctor	Negative	[2], [8]
Physician's health status [Bad Health = 1]	Negative	[13]
Physician's political status [Vehemently anti-government = 1]	Insignificant	[13]
Income from sources other than medical practice	Insignificant	[13]
AMA or AOA member	Negative	[8]
<u>**Practice Arrangements**</u>		
Group practice or medical office size, number of MDs	Positive	[6], [8], [11], [14], [17], [18]
Revenue-sharing arrangements	Mixed	[16]
Expense-sharing arrangements	Insignificant	[13]

Table A-1 (continued)
Page 6

FACTORS	RELATIONSHIP TO FEE LEVELS	REFERENCES
<u>Case Mix</u>		
Case mix	Positive	[4], [5]
<u>Billing Practices and Patterns</u>		
Number of pre- and post-operative visits billed separately by surgeon	Insignificant	[9]
Use of assistant surgeons	Insignificant	[9]
CARRIER PRACTICES [see note (b)]		
<u>Claims Reduction, Denial, and Investigation</u>		
Percent of claims for which amount paid was a reduction from amount submitted	Insignificant	[10]
Percent by which dollar amount of claims reduced	Insignificant	[10]
Investigation rate	Insignificant	[10]
Denial rate	Insignificant	[10]
<u>Reimbursement Policy</u>		
Pricing policy in the absence of customary charges	Insignificant	[10]
Pricing policy in the absence of prevailing charges	Insignificant	[10]
Pricing policy for new physicians	Insignificant	[10]
Minimum number of charges required for computation of prevailing/customary charges	Insignificant	[10]
Treatment of "token" and extreme charges in computation of reasonable charges	Insignificant	[10]
Use of Medicare and non-Medicare claims in reasonable charge determination	Insignificant	[10]

Table A-1 (continued)
Page 7

FACTORS	RELATIONSHIP TO FEE LEVELS	REFERENCES
Processing Time and Backlog		
Ratio of pending to claims processed	Insignificant	[10]
Annual mean processing time	Insignificant	[10]
HOSPITAL CHARACTERISTICS		
Hospital Sector Characteristics		
Hospital beds per capita	Insignificant	[2], [3], [6]
Hospital-physician ratio	Negative	[4]
Hospital occupancy rates	Positive	[4]
Hospital employees per patient	Positive	[4]
Hospital employees per staff physician or per bed	Insignificant	[11]
For-profit status	Positive	[4], [11]
Number of services available in hospital, e.g., pediatric, orthopedic, chronic disease, etc.	Insignificant	[4]
Growth in hospital size	Positive	[4]
Ratio of total hospital beds to extended care hospital beds	Insignificant	[10]
Ratio of general hospitals to hospitals with diagnostic services	Insignificant	[10]
Hospital expense per admission	Positive	[3]
Hospital-Associated Physicians		
Ratio of physicians to interns and residents	Insignificant	[10]
Number of hospitals per residency or intern program	Insignificant	[10]
Population per hospital-based physician	Insignificant	[10]

Table A-1 (continued)
Page 8

FACTORS	RELATIONSHIP TO FEE LEVELS	REFERENCES
Hospital Utilization		
Available bed days per capita	Insignificant	[10]
Inpatient general and osteopathic hospital days per capita	Insignificant	[10]
MEDICARE POLICY FACTORS		
Overpriced procedure policy	Insignificant	[9]

NOTES:

(a) Boardman et al (1981) use factor analysis to characterize the practice styles of office-based physicians and to identify the determinants of those styles. The factors listed here are used in the analysis to characterize physicians' practice styles. The analysis does not directly lend itself to the analysis of fee determinants. These factors are included only to suggest an area of potential fee determinants.

(b) All of the factors related to carrier practices are from Muller et al (1979). The analysis estimates thirteen models of physician fee levels, each with a different measure of physician fees. None of the factors is statistically significant in more than four of the models. Consequently, the summary results are that all of those factors are insignificantly related to physician fee levels. It should be noted, however, that when a factor was statistically significant in more than one equation, it was always of the same sign across those equations. In addition, some of the factors listed were hypothesized to affect fee levels but did not appear in any final models resulting from stepwise regression. By definition, these factors also are insignificantly related to physician fee levels.

(c) The consumer age distribution variables are alternatively measured in the literature, often using categorical rather than continuous variables. The general finding is that the age distribution is significantly related to physician fee levels. It would be misleading simply to categorize the relationship as positive or negative.

(d) The references listed control for specialty differences in two ways. Some studies estimate fee models separately for various specialty groups. Others include a variable to control for the physicians' specialty. Studies of the first type generally report that the magnitude or sign of some of the estimated coefficients varies by specialty. The table interprets this as evidence of significant specialty effects on physician fees. Studies of the second type report statistically significant coefficients on the specialty variables. Consequently, the general finding is that physician specialty is significantly related to physician fee levels.

APPENDIX REFERENCES

	Reference	Notes
[1]	Boardman, Anthony E., John M. Eisenberg, and Sankey V. Williams. Final Report: Physician Decision Making: An Analysis of Work Environment, Input, Pricing, Income and Labor-Leisure Choices. May 1981.	Boardman et al. use factor analysis to characterize and identify determinants of physicians' practice styles. The analytical framework does not lend itself to identification of fee determinants.
[2]	Cromwell, Jerry. "Part Five: The Role of Competition in Physician Pricing and Output," of Final Report: A Study of the Physicians' Services Market in Pennsylvania, by Research Division, Pennsylvania Blue Shield. Research Division, Pennsylvania Blue Shield, Camp Hill, Pennsylvania, January 1983.	This appendix uses Cromwell's results for all specialties combined.
[3]	Cromwell, Jerry and Janet B. Mitchell. "Physician-induced Demand for Surgery." Journal of Health Economics 5 (December 1986): 293-313.	Cromwell and Mitchell note multicollinearity problems in estimation of physician fee model. The analyses use Medicare charge data.
[4]	Custer, William S. "Hospital Attributes and Physician Prices." Southern Economic Journal 52(4):1010-1027.	Custer's analysis does not include a measure of medical practice costs as a potential fee determinant.
	Dyckman, Zachary. "Comments." Issues in Physician Reimbursement, ed. Nancy Thorndike Greenspan. HCFA Pub. No. 03121. Office of Research, Demonstrations, and Statistics, Health Care Financing Administration, Baltimore, Maryland, August 1981.	
	Fisher, CR. "Impact of PPS on Physician Charges Under Medicare." Health Care Financing Review 8(4) (Summer 1987):101-103.	
[5]	Gornick, Marian, Marilyn Newton, and Carl Hackerman. "Factors Affecting Differences in Medicare Reimbursements for Physicians' Services." Health Care Financing Review 4(1) (Spring 1980):15-37.	Gornick et al. do not conduct multivariate analyses. The analyses use Medicare charge data.

Holahan, John and William Scanlon. "Price Controls, Physician Fees, and Physician Incomes from Medicare and Medicaid." The Urban Institute, Washington, D. C., April 1978.

Holahan, John, William Scanlon, Jack Hadley, and Robert Lee. "The Effect of Medicare/Medicaid Reimbursement on Physician Behavior: A Summary of Findings." In Physicians and Financial Incentives, ed. John R. Gabel, Judith Taylor, Nancy T. Greenspan, and Martha O. Blaxall. HCFA Pub. No. 03067. Health Care Financing Administration, Washington, D.C., December 1980.

Hornbrook, Mark. "Comments." Issues in Physician Reimbursement, ed. Nancy Thorndike Greenspan. HCFA Pub. No. 03121. Office of Research, Demonstrations, and Statistics, Health Care Financing Administration, Baltimore, Maryland, August 1981.

[6] Hsiao, William, et al. Analysis of Physician Pricing Behavior, Third Party Administrative Practices and Effects of Financial Incentives on Supply of Physician Services. School of Public Health, Harvard University, March 1986.

This appendix uses Hsiao's et al. results for all physicians.

[7] Lee, Robert H. and Jack Hadley. "Physicians' Fees and Public Medical Care Programs." Health Services Research 16 (2) (Summer 1981): 185-203.

Lee and Hadley's analysis is a test of a multiperiod model of physician pricing in multiple markets. This same empirical model appeares in Holahan, et al. (1980).

[8] Markel, Gene A. " Part Three: Factors Related to Physician Price Variation," in Final Report: A Study of the Physicians' Services Market in Pennsylvania, Research Division, Pennsylvania Blue Shield. Research Division, Pennsylvania Blue Shield, Camp Hill, Pennslvania, January 1983.

This appendix uses results for the entire State of Pennsylvania. The analysis does not include a measure of medical practice costs as a potential fee determinant.

Notes (continued)

[9]	Mitchell, Janet B. and Stephen M. Davidson. 1989a. Geographic Variation in Surgical Fees: Final Report. Center for Health Economics, Needham, Massachusetts, May 1989. Mitchell, Janet B. and Stephen M. Davidson. 1989b. "Geographic Variation in Medicare Surgical Fees." Health Affairs 8(4) (Winter 1989):113-124.	Mitchell and Davidson do not report results of multivariate analysis in this publication. Multivariate analyses are, however contained in the appendix of the unpublished final report (1989b). This analysis uses Medicare charge data.
[10]	Muller, Charlotte G., Jonah Otelsberg, and Nina Pascal. The Effect of Medicare Carrier Practices on Physician Fees: A National Study. Center for Social Research, Graduate School, City University of New York, 1979. Paringer, Lynn. The Effect of the Medicare Economic Index on Reasonable Fees: Evidence from California. Working Paper 1306-01-04. The Urban Institute, Washington, D. C., 1981.	This appendix uses results for all carriers combined. The analysis does not include a measure of medical practice costs as a potential fee determinant. This analysis uses Medicare charge data.
[11]	Pauly, Mark V. "Hospital Characteristics, Physician Productivity, and Fee Levels." Issues in Physician Reimbursement, ed. Nancy Thorndike Greenspan. HCFA Pub. No. 03121. Office of Research, Demonstrations, and Statistics, Health Care Financing Administration, Baltimore, Maryland, August 1981.	Dyckman (1981) and Hornbrook (1981) both note significant data problems in Pauly (1981). Apparently, caution should be exercised in interpreting Pauly's empirical results.
[12]	Pauly, Mark V. and Mark A. Satterthwaite. "The Pricing of Primary Care Physicians' Services: A Test of the Role of Consumer Information." Bell Journal of Economics 12 (Autumn 1981): 488-506.	This appendix uses empirical results for the increasing monopoly model.
[13]	Redisch, Michael, John Gabel and Martha Blaxall. "Physician Pricing, Costs, and Income." Advances in Health Economics and Health Services Research, edited by Richard M. Scheffler, vol 2, Greenwich, Connecticut: JAI Press, 1981.	This appendix uses results for primary care physicians' office-based fees. Analysis does not include a measure of medical practice costs or standard measures of consumer demand.
[14]	Sloan, Frank. "Effects of Health Insurance on Physicians' Fees." Journal of Human Resources 17 (4) 1982.	This appendix uses results for models of visit fees (rather than fees for specific procedures).

		Notes (continued)
[15]	Sloan, Frank A. "Physicians and Blue Shield: A Study of Effects of Physician Control on Blue Shield Reimbursements." Issues in Physician Reimbursement, ed. Nancy Thorndike Greenspan. HCFA Pub. No. 03121. Office of Research, Demonstrations, and Statistics, Health Care Financing Administration, Baltimore, Maryland, August 1981.	This appendix uses results for model of fees for office visits.
[16]	Steinwald, Bruce and Frank A. Sloan. "Determinants of Physicians' Fees." Journal of Business 47 (October 1974): 493-511.	Steinwald and Sloan (1974) note some multicollinearity problems.
[17]	Wilensky, Gail R. and Louis F. Rossiter. "The Relative Importance of Physician-induced Demand in the Demand for Medical Care." Milbank Memorial Fund Quarterly 61 (2): 252-277, 1983.	Wilensky and Rossiter's analysis does not include a measure of medical practice costs as a potential fee determinant.
[18]	Yett, Donald E., Willian Der, Richard L. Ernst, and Joel W. Hay. "Physician Pricing and Health Insurance Reimbursement." Health Care Financing Review 5(2) (Winter 1983):70-80.	Yett et al. do not provide sufficient detail (for example, on model specification) to permit an assessment of any potential methodological strengths or limitations.

APPENDIX B

MAJOR TYPES OF SERVICE REPRESENTED IN FISHER'S IDEAL INDEX

Standard Imaging Procedures

Advanced Imaging Procedures, such as MRI and CAT Scans

Echography

Imaging with other Medical or Surgical Procedures,

Office Visits

Hospital Visits

Emergency Room Services

Home and Nursing Home Visits

Evaluation and Management Services provided by Specialists

Consultations

Major Procedures, such as colectomy, prostatectomy, or mastectomy

Major Procedures, Cardiovascular

Major Procedures, Musculoskeletal

Eye Procedures

Ambulatory Procedures (e.g., excision of a benign lesion, D & C)

Minor Procedures (e.g., debridement of nails, injections)

Oncology Services

Endoscopy Procedures

Dialysis Services

Laboratory Tests

Other Tests (e.g., routine electrocardiogram, cardiovascular stress test)

Other Services: Exceptions and Unclassified Procedures (e.g., surgical trays)

Source: Holahan and Berenson (1991).

Appendix C
Procedures Included in Laspeyres Index

1990 HCPCS	DESCRIPTION	WEIGHT
17000	DESTRUCTION BY ANY METHOD, ONE SKIN LESION	0.0044
19240	MASTECTOMY, MODIFIED RADICAL, INCLUDING AXILLARY LYMPH NODES	0.0035
27130	ARTHROPLASTY PROSTHETIC REPLACEMENT	0.0095
27236	OPEN TREATMENT OF CLOSED OR OPEN FEMORAL FRACTURE	0.0061
27244	OPEN TREATMENT OF CLOSED OR OPEN FEMORAL FRACTURE	0.0079
27447	ARTHROPLASTY, KNEE, CONDYLE AND PLATEAU	0.0151
43235	UPPER GASTROINTESTINAL ENDOSCOPY	0.0112
43239	UPPER GASTROINTESTINAL ENDOSCOPY	0.0087
44140	COLECTOMY, PARTIAL	0.0055
45330	SIGMOIDOSCOPY, FLEXIBLE FIBEROPTIC	0.0055
45378	COLONOSCOPY, FIBEROPTIC, BEYOND SPLENIC FLEXURE	0.0134
45380	COLONOSCOPY, FIBEROPTIC, BEYOND SPLENIC FLEXURE	0.0056
45385	COLONOSCOPY, FIBEROPTIC, BEYOND SPLENIC FLEXURE	0.0117
47605	CHOLECYSTECTOMY	0.0042
49505	REPAIR INGUINAL HERNIA, AGE 5 OR OVER	0.0040
52000	CYSTOURETHROSCOPY (SEPARATE PROCEDURE)	0.0058
66821	DISCISSION OF SECONDARY MEMBRANEOUS CATARACT	0.0212
66984	EXTRACAPSULAR CATARACT REMOVAL	0.1199
70450 (a)	COMPUTERIZED AXIAL TOMOGRAPHY, HEAD OR BRAIN	0.0048
70470 (a)	COMPUTERIZED AXIAL TOMOGRAPHY, HEAD OR BRAIN	0.0035
71010 (a)	RADIOLOGIC EXAMINATION, CHEST	0.0103
71020	RADIOLOGIC EXAMINATION, CHEST, TWO VIEWS, FRONTAL AND LATERAL	0.0117
71020 (a)	RADIOLOGIC EXAMINATION, CHEST, TWO VIEWS, FRONTAL AND LATERAL	0.0114
74160 (a)	COMPUTERIZED AXIAL TOMOGRAPHY, ABDOMEN	0.0037
76091	MAMMOGRAPHY	0.0068
80019	AUTOMATED MULTICHANNEL TEST	0.0100
81000	URINALYSIS	0.0051
84443	THYROID STIMULATING HORMONE (TSH), RIA OR EIA	0.0042
88304	SURGICAL PATHOLOGY, GROSS AND MICROSCOPIC EXAMINATION OF ABNORMAL UNCOMPLICATED TISSUE	0.0044
88305 (a)	SURGICAL PATHOLOGY, GROSS AND MICROSCOPIC EXAMINATION OF ABNORMAL COMPLICATED TISSUE	0.0067
90015	OFFICE MEDICAL SERVICE, NEW PATIENT; INTERMEDIATE SERVICE	0.0075
90020	OFFICE MEDICAL SERVICE, NEW PATIENT; COMPREHENSIVE SERVICE	0.0147
90040	OFFICE MEDICAL SERVICE, ESTABLISHED PATIENT; BRIEF SERVICE	0.0150
90050	OFFICE MEDICAL SERVICE, ESTABLISHED PATIENT; LIMITED SERVICE	0.0765
90060	OFFICE MEDICAL SERVICE, ESTABLISHED PATIENT; INTERMEDIATE SERVICE	0.0902

Appendix C (cont.)
Procedures Included in Laspeyres Index

1990 HCPCS	DESCRIPTION	WEIGHT
90070	OFFICE MEDICAL SERVICE, ESTABLISHED PATIENT; EXTENDED SERVICE	0.0242
90080	OFFICE MEDICAL SERVICE, ESTABLISHED PATIENT; COMPREHENSIVE SERVICE	0.0165
90215	INITIAL HOSPITAL CARE	0.0082
90220	INITIAL HOSPITAL CARE	0.0298
90240	SUBSEQUENT HOSPITAL CARE, EACH DAY; BRIEF SERVICE	0.0099
90250	SUBSEQUENT HOSPITAL CARE, EACH DAY; LIMITED SERVICE	0.0491
90260	SUBSEQUENT HOSPITAL CARE, EACH DAY; INTERMEDIATE SERVICE	0.0610
90270	SUBSEQUENT HOSPITAL CARE, EACH DAY; EXTENDED SERVICE	0.0192
90280	SUBSEQUENT HOSPITAL CARE, EACH DAY; COMPREHENSIVE SERVICE	0.0066
90350	SUBSEQUENT CARE, SKILLED NURSING, INTERMEDIATE CARE OR LTC FACILITY; LIMITED SERVICE	0.0043
90360	SUBSEQUENT CARE, SKILLED NURSING, INTERMEDIATE CARE OR LTC FACILITY; INTERMEDIATE SERVICE	0.0050
90450	NURSING HOME, BOARDING HOME, DOMICILIARY, OR CUSTODIAL CARE; LIMITED SERVICE	0.0039
90515	EMERGENCY DEPARTMENT SERVICE, NEW PATIENT; INTERMEDIATE SERVICE	0.0066
90517	EMERGENCY DEPARTMENT SERVICE, NEW PATIENT; EXTENDED SERVICE	0.0093
90520	EMERGENCY DEPARTMENT SERVICE, NEW PATIENT; COMPREHENSIVE SERVICE	0.0062
90600	INITIAL CONSULTATION; LIMITED	0.0041
90620	INITIAL CONSULTATION; COMPREHENSIVE	0.0385
90630	INITIAL CONSULTATION; COMPLEX	0.0116
90843	INDIVIDUAL MEDICAL PSYCHOTHERAPY BY A PHYSICIAN; 20 TO 30 MINUTES	0.0044
90844	INDIVIDUAL MEDICAL PSYCHOTHERAPY BY A PHYSICIAN; 45 TO 50 MINUTES	0.0092
92004	GENERAL OPHTHALMOLOGICAL SERVICES; COMPREHENSIVE, NEW PATIENT	0.0054
92012	GENERAL OPHTHALMOLOGICAL SERVICES; INTERMEDIATE, ESTABLISHED PATIENT	0.0125
92014	GENERAL OPHTHALMOLOGICAL SERVICES; COMPREHENSIVE, ESTABLISHED PATIENT	0.0157
92083	VISUAL FIELD EXAMINATION WITH MEDICAL DIAGNOSTIC EVALUATION	0.0036
93000	ELECTROCARDIOGRAM, ROUTINE ECG WITH AT LEAST 12 LEADS	0.0221
93010 (a)	ELECTROCARDIOGRAM, ROUTINE ECG WITH AT LEAST 12 LEADS	0.0152
93015	CARDIOVASCULAR STRESS TEST	0.0058
93224	ELECTROCARDIOGRAHIC MONITORING FOR 24 HOURS	0.0054
93307 (a)	ECHOCARDIOGRAPHY, REAL-TIME WITH IMAGE DOCUMENTATION (2D)	0.0123
93910	NON-INVASIVE STUDIES OF LOWER EXTREMITY ARTERIES	0.0038
99172	CRITICAL CARE, SUBSEQUENT FOLLOW-UP VISIT; LIMITED EXAMINATION	0.0047
99173	CRITICAL CARE, SUBSEQUENT FOLLOW-UP VISIT; INTERMEDIATE EXAMINATION	0.0105
99174	CRITICAL CARE, SUBSEQUENT FOLLOW-UP VISIT; EXTENDED RE-EXAMINATION	0.0058
		1.0000

NOTE: (a) professional component

APPENDIX D

INDIVIDUAL PROCEDURES AND TYPES OF SERVICE INCLUDED IN ANALYSIS OF MEDICARE AVERAGE ALLOWED CHARGES

Procedure	HCPCS	Type of Service
Radiologic Exam, Chest, 2 views	71020	Standard Imaging
Computerized Axial Tomography, Head or Brain	70450 (mod 26)	Advanced Imaging
Echocardiography	93307	Echography
Combined Left Heart Catheterization	93547 (mod 26)	Imaging Procedures
Intermediate Visit, Medical Office, Established Patient	90060	Office Visits
Subsequent Hospital Care, Intermediate Services, Each Day	90260	Hospital Visits
Extended Service, Emergency Department, New Patient	90517	Emergency Room Services
Subsequent Care, Intermediate Services, SNF or ICF	90360	Home/Nursing Home Visits
Initial Consultation, Comprehensive	90620	Consultations
Ophthalmological Services: Medical Examination & Evaluation	92014	Specialist Evaluation & Management Services
Transurethral Resection of Prostrate[1]	52601	Major Procedures
Coronary Artery Bypass[1]	33512	Major Cardiovascular Procedures
Arthroplasty (Total Hip Joint Replacement)[1]	27130	Major Musculoskeletal Procedures
Extracapsular Cataract Removal[1]	66984	Eye Procedures
Colonoscopy, Fiberoptic[1]	45378	Endoscopic Procedures

[1]"Overpriced" procedure

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Appendix E
Analysis of Medicare Fee Variation:
Correlation Matrix of Independent Variables (a)

	GPCI	MDOVER65	MDGENFAM	MDTEACH	INCOME	%WHITE	AGE75-84	AGE65-74	MD_MILE	POP_MILE	PRIVATE	PRIVATE FEE	MDSUPPLY	RVUSVC	OVERPRIC
GPCI	1.0000	-0.1144	-0.4587	0.1525	0.7439	-0.3092	-0.3924	0.3324	0.2594	0.3560	-0.0146	0.7689	0.3764	0.1439	-0.2045
	0.0000	0.0789	0.0001	0.0189	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.8229	0.0001	0.0001	0.0267	0.0016
MDOVER65	-0.1144	1.0000	0.5107	-0.5115	-0.1982	0.3259	0.2683	-0.1997	-0.0496	-0.0845	-0.1308	-0.1090	-0.4780	-0.2036	-0.0070
	0.0789	0.0000	0.0001	0.0001	0.0022	0.0001	0.0001	0.0020	0.4472	0.1947	0.0443	0.0942	0.0001	0.0016	0.9144
MDGENFAM	-0.4587	0.5107	1.0000	-0.4849	-0.5299	0.3550	0.3528	-0.3207	-0.1494	-0.2059	0.0116	-0.4439	-0.6425	-0.2906	-0.0199
	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0214	0.0014	0.8593	0.0001	0.0001	0.0001	0.7610
MDTEACH	0.1525	-0.5115	-0.4849	1.0000	0.1977	-0.2992	-0.1811	0.1207	0.0766	0.1062	-0.0074	0.1639	0.5979	0.2400	0.1039
	0.0189	0.0001	0.0001	0.0000	0.0022	0.0001	0.0052	0.0636	0.2403	0.1028	0.9093	0.0115	0.0001	0.0002	0.1107
INCOME	0.7439	-0.1982	-0.5299	0.1977	1.0000	-0.1427	-0.2217	0.1005	0.3890	0.4404	0.2972	0.5960	0.5549	0.0827	-0.1206
	0.0001	0.0022	0.0001	0.0022	0.0000	0.0281	0.0006	0.1229	0.0001	0.0001	0.0001	0.0001	0.0001	0.2045	0.0637
%WHITE	-0.3092	0.3259	0.3550	-0.2992	-0.1427	1.0000	0.3411	-0.3750	-0.2031	-0.2514	0.2743	-0.3940	-0.3015	-0.1825	0.1499
	0.0001	0.0001	0.0001	0.0001	0.0281	0.0000	0.0001	0.0001	0.0017	0.0001	0.0001	0.0001	0.0001	0.0048	0.0210
AGE75-84	-0.3924	0.2683	0.3528	-0.1811	-0.2217	0.3411	1.0000	-0.9407	0.0758	0.0629	-0.0223	-0.3455	-0.0701	-0.2236	0.0503
	0.0001	0.0001	0.0001	0.0052	0.0006	0.0001	0.0000	0.0001	0.2453	0.3354	0.7324	0.0001	0.2827	0.0005	0.4410
AGE65-74	0.3324	-0.1997	-0.3207	0.1207	0.1005	-0.3750	-0.9407	1.0000	-0.0873	-0.0780	-0.1261	0.3301	-0.0100	0.2255	-0.0781
	0.0001	0.0020	0.0001	0.0636	0.1229	0.0001	0.0001	0.0000	0.1806	0.2314	0.0525	0.0001	0.8781	0.0005	0.2312
MD_MILE	0.2594	-0.0496	-0.1494	0.0766	0.3890	-0.2031	0.0758	-0.0873	1.0000	0.9764	-0.1028	0.4034	0.4538	0.0119	-0.0061
	0.0001	0.4472	0.0214	0.2403	0.0001	0.0017	0.2453	0.1806	0.0000	0.0001	0.1145	0.0001	0.0001	0.8554	0.9252
POP_MILE	0.3560	-0.0845	-0.2059	0.1062	0.4404	-0.2514	0.0629	-0.0780	0.9764	1.0000	-0.1159	0.4921	0.4843	0.0244	-0.0377
	0.0001	0.1947	0.0014	0.1028	0.0001	0.0001	0.3354	0.2314	0.0001	0.0000	0.0750	0.0001	0.0001	0.7084	0.5632
PRIVATE	-0.0146	-0.1308	0.0116	-0.0074	0.2972	0.2743	-0.0223	-0.1261	-0.1028	-0.1159	1.0000	-0.1907	0.0415	-0.0679	0.1112
	0.8229	0.0443	0.8593	0.9093	0.0001	0.0001	0.7324	0.0525	0.1145	0.0750	0.0000	0.0032	0.5253	0.2978	0.0877
PRIVATE FEE	0.7689	-0.1090	-0.4439	0.1639	0.5960	-0.3940	-0.3455	0.3301	0.4034	0.4921	-0.1907	1.0000	0.3927	0.0871	-0.2694
	0.0001	0.0942	0.0001	0.0115	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0032	0.0000	0.0001	0.1812	0.0001
MDSUPPLY	0.3764	-0.4780	-0.6425	0.5979	0.5549	-0.3015	-0.0701	-0.0100	0.4538	0.4843	0.0415	0.3927	1.0000	0.2601	-0.0075
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.2827	0.8781	0.0001	0.0001	0.5253	0.0001	0.0000	0.0001	0.9090
RVUSVC	0.1439	-0.2036	-0.2906	0.2400	0.0827	-0.1825	-0.2236	0.2255	0.0119	0.0244	-0.0679	0.0871	0.2601	1.0000	0.4603
	0.0267	0.0016	0.0001	0.0002	0.2045	0.0048	0.0005	0.0005	0.8554	0.7084	0.2978	0.1812	0.0001	0.0000	0.0001
OVERPRIC	-0.2045	-0.0070	-0.0199	0.1039	-0.1206	0.1499	0.0503	-0.0781	-0.0061	-0.0377	0.1112	-0.2694	-0.0075	0.4603	1.0000
	0.0016	0.9144	0.7610	0.1107	0.0637	0.0210	0.4410	0.2312	0.9252	0.5632	0.0877	0.0001	0.9090	0.0001	0.0000

(a) The first number is the correlation between the corresponding row and column variables. The second number is the statistical significance of the correlation coefficient.

APPENDIX F

IMPACT OF UPDATING THE OFFICE RENT PRICE PROXY

This Appendix reviews how the office rent price proxy would change as a result of moving from the current index based on 1987 HUD Fair Market Rents (FMR) to one based on either 1990 FMRs or an average of 1988 through 1990 FMRs. In both instances, the rental price proxy changes by less than five percentage points in the large majority of localities. Table F-1 shows the localities experiencing large changes due to a shift to 1990 data. Table F-2 contains localities undergoing similar changes using a three-year average FMR.

Not surprisingly, more localities experience these larger changes (i.e., more than five percentage points) when the update is based on a single year than when it is based on several years. Moving to an index based on 1990 FMRs would result in increases of more than five percentage points in 17 localities and decreases of greater than five percentage points in 16 localities. Basing the updated rental proxy on data from 1988, 1989, and 1990 causes only 11 localities to change by this degree in either direction. However, with the exception of Cincinnati, OH, the areas that the gain or lose at least five percentage points as a result of moving to the three-year average FMR would also be classified this way using a single recent year of FMRs. The precise magnitudes of the changes are, of course, affected by the data used to update.

The localities that would gain the most as a result of moving to the rental price proxy based on the three-year average (the more stable alternative) would be Dallas and Denton, TX. Both of these localities are part of the same Metropolitan Statistical Area. Hawaii would experience an increase almost as large as these Texas localities. The greatest losses would occur in Spokane and Richland, WA, Southwest Connecticut, Oakland and Berkeley, CA, and Alaska.

Table F-1

Localities Experiencing Large Changes[a] in the Rental Price Proxy as a Result of Using 1990 Fair Market Rents (FMRs)

Locality Name (Code)	1987 FMR	1990 FMR	Change
Large Gainers			
Hawaii (1120-01)	1.268	1.547	0.279
Seattle (King Cnty), Wa (932-02)	1.002	1.169	0.166
D.C. & Md/Va Suburbs (580-01)	1.374	1.508	0.134
Dallas, TX (900-11)	0.863	0.990	0.126
Denton, TX (900-12)	0.863	0.990	0.126
Rhode Island (870-01)	1.058	1.153	0.095
Vermont (780-50)	0.966	1.051	0.086
Northern New Jersey (860-01)	1.339	1.424	0.085
Massachusetts Urban (700-01)	1.444	1.5[illegible]8	0.075
Delaware (570-01)	1.051	1.424	0.073
San Antonio, TX (900-07)	0.858	0.929	0.071
Fort Worth, TX (900-28)	0.863	0.923	0.061
MA Suburbs/Rural(cities) (700-02)	1.272	1.329	0.057
Manhattan, NY (803-01)	1.578	1.634	0.056
Queens, NY (14330-04)	1.578	1.634	0.056
NYC Suburbs/Long I., NY (803-02)	1.565	1.621	0.056
Southern New Jersey (860-03)	1.072	1.124	0.052
Large Losers			
Spokane & Richland (cities)WA (932-03)	0.970	0.822	-0.148
Phoenix, AZ (1030-01)	1.134	0.990	-0.145
Oakland-Berkeley, CA (542-07)	1.581	1.452	-0.129
SW Connecticut (10230-02)	1.397	1.279	-0.11[illegible]
Santa Clara, CA (542-09)	1.720	1.605	-0.114
Utah (910-09)	0.917	0.811	-0.106
Detroit, MI (710-01)	1.058	0.950	-0.103
E. Cen. & NE WA (excl. Spokane) (932-04)	0.932	0.853	-0.079
Alaska (1020-01)	1.304	1.234	-0.070
N. K.C. (Clay/Platte), MO (740-02)	0.885	0.822	-0.063
K.C. (Jackson Cnty), MO (740-03)	0.885	0.822	-0.063
Suburban K.C., KS (740-04)	0.885	0.822	-0.063
Kansas City, KS (740-05)	0.885	0.822	-0.063
Colorado (550-01)	0.981	0.920	-0.061
New Orleans, LA (528-01)	1.011	0.951	-0.061
Oklahoma (1370-00)	0.799	0.739	-0.060

a. More than a 5 percentage point gain or loss.

Table F-2

Localities Experiencing Large Changes[a] in the Rental Price Proxy as a Result of Using Three-Year Average of Fair Market Rents (FMRs)

Locality Name (Code)	1987 FMR	Three-Year FMR Average[b]	Change
Large Gainers			
Dallas, TX (900-11)	0.863	1.011	0.148
Denton, TX (900-12)	0.863	1.011	0.148
Hawaii (1120-01)	1.268	1.408	0.140
Seattle (King Cnty), Wa (932-02)	1.002	1.011	0.109
Rhode Island (870-01)	1.058	1.144	0.086
Vermont (780-50)	0.966	1.044	0.078
Massachusetts Urban (700-01)	1.444	1.514	0.078
Northern New Jersey (860-01)	1.339	1.408	0.056
San Antonio, TX (900-07)	0.858	0.924	0.067
Cincinnati, OH (16360-02)	0.807	0.866	0.056
Delaware (570-01)	1.051	1.408	0.056
Large Losers			
Spokane & Richland (cities)WA (932-03)	0.970	0.924	-0.143
SW Connecticut (10230-02)	1.397	1.265	-0.132
Oakland-Berkeley, CA (542-07)	1.581	1.408	-0.129
Alaska (1020-01)	1.304	1.193	-0.111
Detroit, MI (710-01)	1.053	0.958	-0.095
Phoenix, AZ (1030-01)	1.134	1.061	-0.073
Santa Clara, CA (542-09)	1.720	1.647	-0.072
Utah (910-09)	0.917	0.846	-0.072
E. Cen. & NE WA (excl. Spokane) (932-04)	0.932	0.861	-0.071
New Orleans, LA (528-01)	1.011	0.947	-0.065
Colorado (550-01)	0.981	0.920	-0.061

a. More than a 5 percentage point gain or loss.

b. Based on 1988, 1989, and 1990 data.

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Given the data available, the only conclusion is that the rental markets have undergone actual changes that caused the relative rents in both the gaining and losing areas to shift substantially. In some areas, some or all of the change observed may be due to the fact that 1987 happened to be an anomalous year relative to long-term patterns.

APPENDIX G

DATA SOURCES AND CONSTRUCTION

The data sources for this analysis are the Health Resources Administration Bureau of Health Professions' Area Resource File (ARF), various Medicare beneficiary files (the Medicare Patient Analysis and Review file [MedPAR], the Part B Medicare Annual Data [BMAD], and the Denominator file), the Census Bureau's Current Population Survey (CPS), and the Health Insurance Association of America's Medical and Surgical Prevailing Healthcare Charges System (HIAA). Data are generally for 1989 and 1990--the source and year of the variables used in the analysis are noted in Table G-1. The construction of the variables is discussed in detail in this appendix. However, before discussing specific variables, there are several broader issues pertaining to the data construction that are reviewed.

Mapping County Data to the Locality. The ARF provides a number of the variables we examine. Since ARF data are reported at the county level, they must be "mapped" from the county to the Medicare payment locality level. The county-to-locality mapping draws on the methods used to develop the Geographic Practice Cost Index (GPCI). For the GPCI, counties were initially mapped to localities using the Medicare Directory of Prevailing Charges 1984. Revisions were made to the mapping in order to make the definitions current based on comments from HCFA.

A complexity arises in situations where a given county falls within two localities. This problem is solved by assigning population counts to portions of the county contained in each locality using postal zip code areas. Thus the proportion of the county's population located in a given locality can be used to assign values to the locality. Counties that are entirely located in a single locality (the vast majority) will have population proportions equal to 1.0. However, a county with half its population in one locality and half in another will have two population proportions (.50 and .50) associated with the respective localities. To obtain a count of physicians for a given locality, for example, one would multiply the total count of physicians in the county by the population proportion. The total physician count for the locality is the sum of complete and partial counties assigned to the locality. Calculating means, rates, or ratios for the locality is accomplished by weighting (based on population) across the complete or partial counties that make up the locality.

Age-Sex Adjusting. In several instances we have age-sex adjusted the variables in order to make more valid comparisons. In each instance, standard epidemiological methods of indirect standardization were used. Data from Medicare sources were obtained at a level of disaggregation that allowed age-sex adjusting. Certain ARF variables were not obtainable at a sufficient level of disaggregation to allow age-sex adjustment.

Health Status Variables. Five disease-specific mortality rates were obtained from the ARF. Cancer mortality rates (per 1000) are an average for all cancers for the period 1970-1979. Cancer mortality rates are not age-sex adjusted, but they are reported separately for (white) males and females. Mortality rates for heart disease, cardiovascular disease, and flu/pneumonia for

TABLE G-1
Access Environment Variable Data Sources

	Year	Data Source
HEALTH STATUS		
Mortality Rate--All Causes		
Mortality Rate Ages 65-74	1988	Area Resource File
Mortality Rate Ages 75-84	1988	Area Resource File
Mortality Rate Ages 85+	1988	Area Resource File
Age-Adjusted Mortality Rate Ages 65+	1989	Area Resource File
Mortality Rate--Disease Specific		
Female Cancer Death Rate per 1000	1970-1979	Area Resource File
Male Cancer Death Rate per 1000	1970-1979	Area Resource File
Heart Disease Death Rate per 1000	1988	Area Resource File
Other Cardiovascular Disease Death Rate per 1000	1988	Area Resource File
Flu and Pneumonia Death Rate per 1000	1988	Area Resource File
Casemix		
Medicare Inpatient Physician Service Casemix	1989	MEDPAR/BMAD
PREDISPOSING		
Medicare Enrollee Composition		
Percentage Aged Less Than 64	1988	Denomonator File
Percentage Aged 80 to 84	1989	Denomonator File
Percentage Aged 85 or Greater	1988	Denomonator File
Percentage Non-White	1989	Area Resource File
Urbanization		
Population per Square Mile	1989	Area Resource File
ENABLING--INCOME AND ECONOMIC STRESS		
Income/Poverty		
Per Capita Income	1989	Area Resource File
Percent of People Under 100% of Poverty	1988	Census Population Study
Insurance Coverage		
Percent Uninsured	1988	Census Population Study
Percent Insured by Medicaid	1988	Census Population Study
Unemployment		
Unemployement Rate per 1000	1990	Census Population Study

TABLE G-1 (cont.)
Access Environment Variable Data Sources

	Year	Data Source
ENABLING--HEALTH SERVICE SUPPLY		
Physician Supply		
Patient Care Physicians per 1000	1989	Area Resource File
Physicians per Square Mile	1989	Area Resource File
Physician Composition		
Percentage Primary Care	1989	Area Resource File
Percentage Surgery Specialists	1989	Area Resource File
Percentage Medical Specialists	1989	Area Resource File
Percentage Radiology, Anesthesiology, and Radiology Specialists	1989	Area Resource File
Percentage Office-Based	1989	Area Resource File
Hospital Beds		
Short Term General Hospital Beds per 1000	1989	Area Resource File
ENABLING--PRACTICE STYLE		
Medicare Utilization Rates		
Age-Sex Adjusted Admission Rate per 1000	1989	MEDPAR/BMAD
Casemix-Adjusted Physician Service Per Admission	1989	MEDPAR/BMAD
Adjusted Inpatient Physician Service Per Enrollee	1989	BMAD/Denomonator File
Adjusted Outpatient Physician Service Per Enrollee	1989	BMAD/Denomonator File
Adjusted Total Physician Service Per Enrollee	1989	BMAD/Denomonator File
Length of Stay	1989	Area Resource File
ENABLING--MEDICARE MARKET SHARE AND POLICY		
Medicare Market Share		
Percent of Population Insured by Medicare	1989	Denomonator File
Medicare Days as Percentage of All Inpatient Days	1989	Area Resource File
Medicare Inpatient Discharges as Percentage of All Inpatient Discharges	1989	Area Resource File
Medicare Part B Enrollees in HMO's	1989	Denomonator File
Medicare Participation/Assignment		
Percentage of Allowed Charges Participating	1991	BDMS National Claims History File
Percentage of Allowed Charges Non-Participating Assigned	1991	BDMS National Claims History File
Percentage of Allowed Charges Non-Participating Non-Assigned	1991	BDMS National Claims History File
Percentage of Allowed Charges Participating and Assigned	1991	BDMS National Claims History File
Medicare Fees Relative to Private Fees		
All Services	1990	HIAA/Physician Public Use File
Visit Services	1990	HIAA/Physician Public Use File
Imaging Procedures	1990	HIAA/Physician Public Use File
Major Procedures	1990	HIAA/Physician Public Use File
Ambulatory Procedures	1990	HIAA/Physician Public Use File
Laboratory Tests	1990	HIAA/Physician Public Use File

1988 were obtained from ARF. These rates are for all ages and sexes and could not be age-sex adjusted. The importance of a given disease-specific mortality rate takes on greater or lesser significance in different parts of the country, which makes comparisons across geographic areas misleading, even if age-sex adjustment has been undertaken. In other words, the overall mortality rates for two localities (located in different states, for example) could be the same, but the underlying, disease-specific mortality rates could be very different. One area could suffer from high cancer mortality rates, whereas the other could suffer from high flu/pneumonia mortality rates.

Mortality rates from all causes, particularly when adjusted for age-sex differences, do not have the traditional comparability problems associated with disease-specific rates. Overall mortality rates for three elderly age categories (i.e., 65-74 years, 75-84 years, and 85 or more years) for 1988 were obtained from the ARF. Using these three age categories, an overall age-adjusted mortality rate for the elderly was obtained.

Finally, a Medicare inpatient physician service of casemix measure is reported for the locality. The index can be thought of as a PPS-like casemix measure except that physician charges, rather than hospital costs, are the basis of the index. The casemix measure was developed by computing 1987 physician charges per admission (deflated for prevailing charges) for each DRG. Normalizing the mean physician charge per admission for each DRG to the national physician charge per admission produces a set of relative weights. These inpatient physician weights are used to calculate casemix values in the usual manner (i.e., multiplying each admission by its weight and summing across all admissions). See Miller and Welch 1991 for a complete discussion of the casemix index construction. Since the weights were developed using 1987 national weights but applied to 1989 admissions, the mean casemix value is 1.02 across all localities.

<u>Predisposing Variables</u>. The objective of the predisposing category is to determine the proportion of certain groups in the locality that have been identified as vulnerable--minorities, the disabled, the very old, and rural residents. In practice, these variables describe the age and racial composition of enrollees in the locality as well as the locality's degree of urbanization. The 1989 Medicare Denominator file reports demographic information on Medicare enrollees. Racial composition is measured using nonwhite enrollees as a percentage of all enrollees. The percentage of enrollees aged 64 years or less serves as a proxy for the disabled. The percentage of enrollees aged 80 to 85 years and 85 years or more measures the proportion of the very old. Urbanization in the locality is measured using population density, that is the total population divided by total square miles in 1990.

<u>Enabling--Income and Economic Stress Variables</u>. Five variables are included in this category--per capita income, the poverty rate, the unemployment rate, the percentage insured by Medicaid, and the percentage uninsured. Recall that these measures pertain to the entire population of the locality, not just to the elderly or the Medicare population. Total per capita personal income for 1989 and the unemployment rate (based on the civilian labor forced aged 16 years and older) for 1990 were obtained from the ARF.

The CPS for 1989-1991 is the source for the insurance coverage and poverty measures. Averages for these variables are obtained from the last half of 1989, all of 1990, and the first half of 1991. As noted above, reliable health insurance coverage and poverty measures are available only for certain MSAs, and were mapped to the locality level. Statewide estimates were used for MSAs not represented in the CPS and for non-MSA areas. Given that state estimates are used as proxies for small MSAs and rural areas, measurement error is present in these variables.

Enabling--Supply Variables. Total nonfederal, patient care physicians (MDs) per capita (1000s) for 1989 were obtained from ARF. Using this same universe of physicians, the locality's physician specialty composition was also measured. Specialty composition was measured as the percentage of physicians: primary care; medical specialists; surgical specialists; and radiologists, anesthesiologists, and pathologists (RAPs). Primary care is defined as general, family practice, and general internal medicine physicians. The medical specialty category includes medical specialties (e.g., pulmonary diseases, nephrology, allergy), pediatrics, obstetrics/gynecology, emergency medicine, dermatology, and psychology. Surgical specialists includes ophthalmology, orthopedic, thoracic, plastic, and other surgical specialties (e.g., neurology, urology). Other physician measures obtained from ARF include the percentage of physicians based in offices and physician density (physicians per square mile). Finally, an additional supply measure, short-term hospital beds per capita (1000s) for 1989, was obtained from ARF.

Enabling--Practice Style Variables. A number of utilization rates for the Medicare population were constructed to examine practice style variations. The measures are all for 1989 and were constructed from the following Medicare beneficiary files: the 100 percent Denominator file (enrollee counts and demographics), the 100 percent MedPAR (admissions), and the 5 percent BMAD (physician charges). Five utilization measures were constructed: admissions per enrollee, physician charges per admission, inpatient physician charges per enrollee, outpatient (i.e., non-inpatient) physician charges per enrollee, and total physician charges per enrollee. Because charges have been deflated for prevailings, they can be thought of as volume and intensity or, for expositional purposes, "physician services." The admission rate is age-sex adjusted. The inpatient physician services measure is casemix adjusted using the casemix measure described above. The inpatient physician services per enrollee figure is both casemix and age-sex adjusted because it is the product of the admission rate and services per admission. Outpatient (i.e. non-inpatient) physician services per enrollee is age-sex adjusted. The total physician services per enrollee figure is the sum of inpatient and outpatient physician services per enrollee. Twelve age-sex cells were used to age-sex adjust these Medicare variables: male/female; 64 years and less, 65-69, 70-74, 75-79, 80-84, and 85 and older. Mean Medicare inpatient length of stay is also reported.

Enabling--Medicare Market Share and Policy Variables. Market share is measured with three variables. Using Medicare enrollee counts (from the Denominator file) and the total population for 1989, the percentage of the locality's population enrolled in Medicare is calculated. Total inpatient discharges and days as well as Medicare inpatient days and discharges were obtained from the ARF for 1989. Using these data, Medicare inpatient days/discharges as a percentage of all days/discharges were calculated.

Medicare policy variation is measured in several ways. From the Denominator file, the percentage of beneficiaries enrolled in HMOs in the locality was calculated for 1989. Participation and assignment rates for the locality are measured using 1991 allowed charges obtained from the National Claims History (NCH) file. Using these data, the following charge measures are calculated: percent participating, percent nonparticipating assigned, percent assigned (the sum of the preceding two categories), and percent nonparticipating, unassigned.

Finally, a set of indices summarizing the relationship of Medicare fees under the MFS to private insurance fees in the locality was developed. These indices were based on a set of physician services (i.e. HCPCS codes) that account for a significant proportion of Medicare physician charges, were representative of the spectrum of physician services (e.g., visits, tests, surgery), and were likely to be found in a non-Medicare population. Eighty-four procedures accounting for 63 percent of Medicare physician payments under the MFS were selected (see Table G-2). Medicare fees for each procedure in each locality were calculated using the MFS methodology. Since the MFS fee is compared to private fees for 1990, the 1992 conversion factor (CF) was deflated to 1990 using the MEIs for primary care and other services.

Private insurance fees for the same services were obtained from the HIAA's 1990 national database. HIAA fees are reported at the 3-digit zip code level and thus have to be mapped to localities. Counties were mapped to 3-digit zip code areas using the U.S. Postal Service's National Zip Code and Post Office Directory. Fees were assigned to the county, based on the proportion of the population of the 3-digit zip code area accounted for by the county. Once fees were assigned to counties, county-level values were mapped to the locality.

The private fee data are mean submitted charges--the database does not contain what insurers actually pay. What insurers actually pay in an area will be determined by fee screens and the presence of nontraditional reimbursement methods (e.g., capitation, fee schedules). Commercial insurers generally use prevailing charge fee screens ranging from the 80th to the 95th percentile. Pope et al. (1991) performed a sensitivity analysis and found mean fees (at the MSA level) to be insensitive to the range of percentile cut-offs (e.g., using a 90th percentile cut-off reduced the mean charge by only 1 percent). This may not be surprising when one considers that private insurer fee screens generally use prevailing charge data for the most current 6-12 month period and do not constrain the rate of increase in prevailing charges. In other words, submitted charges are used to develop prevailing charge screens and private insurers generally use very current data such that fees screens are likely to affect only the most extreme tail of the charge distribution. Since the sensitivity analysis had limitations (i.e., fee screen cut-off percentiles vary, the geographic basis of the fee screens varies, and nontraditional payment methods cannot be simulated), Pope et al. conclude that private fee estimates are likely to be overestimates. To compensate for this potential overstatement, we use 95 percent of the mean private fee (rather than the mean) in the indices.

Table G-2

Selected Physician Services Used to Develop Medicare/Private Fee Index

HCPCS Code	Description	Percentage of Total MFS Payments
Imaging Procedures		
71010 26	Chest X-Ray	0.469
71020 26	Chest X-Ray, 2 Views	0.688
74270 26	Colon X-Ray	0.113
76091 26	Mammography	0.203
78306 26	Bone Imaging	0.142
70470 26	CAT Scan, Head	0.182
70551 26	MRI, Brain	0.090
74160 26	CAT Scan, Abdomen	0.172
76700 26	Echography, Abdomen	0.162
93307	Echocardiography	0.464
93320	Doppler Echocardiography	0.151
93547	Combined Left Heart Catheter	0.467
93549	Combined Right and Left Heart Catheter	0.331
Subtotal of Payments		3.634
Visit Services		
99203	New Visit	0.606
99204	New Visit	1.119
99212	Established Visit	1.088
99213	Established Visit	12.230
99214	Established Visit	1.915
99215	Established Visit	1.335
99222	Initial Hospital Visit	1.870
99223	Initial Hospital Visit	1.434
99231	Subsequent Hospital Visit	5.713
99232	Subsequent Hospital Visit	5.406
99233	Subsequent Hospital Visit	0.749
99238	Hospital Discharge Day	0.803
99291	Critical Care First Hour	0.534
99283	Emergency Visit	0.522
99284	Emergency Visit	0.892
99285	Emergency Visit	1.161
99312	Subsequent Nursing Visit	0.499
99332	Established Patient Nursing Visit	0.515
92004	Eye Exam, New Patient	0.540
92012	Eye Exam, Established Patient	0.877

HCPCS Code	Description	Percentage of Total MFS Payments
92014	Eye Exam, Established Patient	1.158
99244	Consultation	0.770
99254	Initial Consultation	1.992
99255	Initial Consultation	0.639
Subtotal of Payments		44.367
Major Procedures		
19240	Mastectomy	0.157
44140	Colectomy	0.246
47605	Cholecystectomy	0.183
52601	Prostatectomy (TURP)	0.729
33207	Insert Pacemaker	0.104
33511	CABG	0.161
33512	CABG	0.372
33513	CABG	0.328
33514	CABG	0.129
35081	Direct Repair of Aneurysm	0.112
36489	Placement of Venous Catheter	0.107
92982	Coronary Artery Dilation	0.286
93503	Right Heart Catheter	0.170
27125	Repair of Complete Shoulder	0.118
27130	Arthroplasty	0.415
27236	Repair of Thigh Fracture	0.270
27244	Repair of Thigh Fracture	0.422
27447	Arthroplasty Knee	0.561
Subtotal of Payments		4.870
Ambulatory Procedures		
65855	Laser Surgery of Eye	0.224
66821	Discission of Secondary Membraneous Cataract	0.628
66984	Cataract Removal w/Lens Insertion	3.859
11642	Excision, Lesion--Face, Eye,	0.105
11750	Excision of Nail	0.102
19120	Excision of Cyst	0.114
49505	Repair of Hernia	0.139
10060	Incision and Drain of Abscess	0.204
11730	Avulsion of Nail Plate	0.203

Table G-2 (continued)
Page 3

HCPCS Code	Description	Percentage of Total MFS Payments
17000	Destruction by Facial Lesion	0.215
20610	Arthrocentesis	0.236
43235	Upper GI endoscope	0.453
43239	Upper GI endoscope	0.336
45330	Sigmoidocopy	0.225
45378	Colonoscopy	0.514
45380	Colonoscopy	0.210
45385	Colonoscopy	0.400
52000	Cystourethroscopy	0.249
90935	Hemodialysis	0.179
90937	Hemodialysis	0.129
Subtotal of Payments		8.724
Diagnostic Tests		
80500	Clincal Pathology Consultation	0.066
92567	Basic Comprehensive Audiometry	0.080
93005	Routine ECG	0.654
93017	Cardiovascular Stress Test	0.144
93018	Cardiovascular Stress Test	0.197
93225	ECG Monitor/Review 24 hrs	0.080
93227	ECG Monitor/Review 24 hrs	0.167
94060	Bronchospasm Evaluation	0.048
95900	Nerve Conduction Test	0.093
Subtotal of Payments		1.529
Total Payments		63

Table G-3

National Weights Used for
Medicare/Private
Fee Index

Type of Service	Weight
Imaging	0.12
Visits	0.54
Major Procedures	0.12
Ambulatory Procedures	0.20
Tests	0.03
TOTAL	1.00

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Thus the fee indices summarize the ratio of Medicare fees to private fees within the locality. Five service-specific indices--visits, imaging (e.g., x-rays, MRIs), ambulatory procedures (e.g., hernia repair, endoscopy), major procedures (e.g., CABG, arthroplasty), diagnostic tests (e.g., cardiovascular stress test, routine ECG)--and one summary index are constructed. Since the indices are based on a selected set of procedures, they must be re-weighted to be representative of all physician services. National weights were developed using all physician services subject to the MFS. To be consistent with the type of service categories used for the fee indices (i.e., visits, imaging, etc.), MFS payments were aggregated to the type-of-service level using the type-of-service classification scheme developed by Berenson and Holahan (1992). Table G-3 reports the national weights.

APPENDIX H

MFS IMPACT AND ACCESS FACTORS IN PUERTO RICO

The HCFA OACT did not simulate impacts for Puerto Rico because of data were incomplete and unreliable. Our efforts to undertake a separate simulation of MFS impacts on Puerto Rico using a different database were unsuccessful for similar reasons. Nonetheless, Puerto Rico is expected to experience disproportionately large reductions in payments per services. For example, the American Medical Association estimated Puerto Rico as experiencing a 15 percent reduction in payments per service by 1996 (Reynolds 1991).

Thus for the purposes of the access analysis Puerto Rico should be considered among the localities experiencing large reductions. However, many of the data sources from which the access analyses is drawn (e.g., the Area Resource File) did not include data for Puerto Rico. We were able to obtain participation and assignment data and certain physicians supply/composition figures.

Participation/Assignment
(Percentage of Allowed Charges 1991)

Participating	91.38%
Nonparticipation, Assigned	7.21%
Nonparticipation, Nonassigned	1.41%
Participation and Non-Par Assigned	98.59%

Physician Supply/Composition

Nonfederal Physicians (MD) per 1000	1.92	
Percentage Patient Care	81.94%	
Percentage General Practice		13.06%
Percentage Medical Specialists		17.44%
Percentage Surgical Specialists		13.08%
Percentage Other		12.10%
Percentage Hospital Based		26.26%

Data Sources:

Participation and Assignment Rates--HCFA BDMS National Claims History File
Physician Supply/Composition--AMA 1990 Physician Characteristics and Distribution in the U.S.

APPENDIX I
Localities Experiencing Disproportionate Losses or Gains Under the Medicare Fee Schedule

Losing Localities	MFS Impact (a)
MANHATTAN, NY	-0.25
MIAMI, FL	-0.23
LAS VEGAS,ET AL(CITIES),NV	-0.23
FORT LAUDERDALE, FL	-0.19
ALASKA	-0.19
SAN DIEGO/IMPERIAL, CA	-0.18
LOS ANGELES, CA (b)	-0.17
RIVERSIDE, CA	-0.17
DALLAS, TX	-0.17
SANTA BARBARA, CA	-0.17
VENTURA, CA	-0.17
SAN BERNARDINO/E.CENTRAL CA	-0.16
HOUSTON, TX	-0.16
FLAGSTAFF (CITY), AZ	-0.16
HAWAII	-0.16
BAKERSFIELD, CA	-0.15
N/NC FLORIDA CITIES	-0.15
SOUTHEAST RURAL TEXAS	-0.15
SAN ANTONIO, TX	-0.15
RENO, ET AL (CITIES), NV	-0.15
STOCKTON/SURR. CNTYS, CA	-0.14
PHOENIX, AZ	-0.14
FRESNO/MADERA, CA	-0.13
ANAHEIM-SANTA ANA, CA	-0.13
BIRMINGHAM, AL	-0.12
MONROE, LA	-0.12
MERCED/SURR. CNTYS, CA	-0.12
REST OF FLORIDA	-0.12
BALTIMORE/SURR. CNTYS, MD	-0.12
WESTERN RURAL TEXAS	-0.12
VICTORIA, TX	-0.12
TUCSON (CITY), AZ	-0.12
SMALL GA CITIES 02	-0.12
CLEVELAND, OH	-0.12
ALEXANDRIA, LA	-0.11
KINGS/TULARE, CA	-0.11
CORPUS CHRISTI, TX	-0.11
COLUMBUS, OH	-0.11
NEW ORLEANS, LA	-0.10
SHREVEPORT, LA	-0.10
NE RURAL CA	-0.10
SACRAMENTO/SURR. CNTYS, CA	-0.10
SUBURBAN KANSAS CITY, KS	-0.10
PHILLY/PITT MED SCHS/HOSPS	-0.10

Gaining Localities	MFS Impact (a)
TEMPLE, TX	0.71
MIDLAND, TX	0.55
ORANGE, TX	0.54
LAREDO, TX	0.44
BRAZORIA, TX	0.39
WACO, TX	0.37
ODESSA, TX	0.35
E.CEN+NE WA (EXCL SPOKANE)	0.32
SOUTHWEST WISCONSIN	0.27
REST OF MO	0.27
MC ALLEN, TX	0.26
BROWNSVILLE, TX	0.25
ABILENE, TX	0.24
LONGVIEW, TX	0.24
REST OF MISSISSIPPI	0.24
SOUTHWEST IOWA	0.24
REST OF VIRGINIA	0.23
GRAYSON, TX	0.22
REST OF KENTUCKY	0.21
REST OF INDIANA	0.20
CENTRAL WISCONSIN	0.20
BEAUMONT, TX	0.17
REST OF NORTH CAROLINA	0.17
NORTHEAST IOWA	0.16
TEXARKANA, TX	0.15
NORTH CENTRAL IOWA	0.15
SAN ANGELO, TX	0.15
RURAL NW COUNTIES, MO	0.15
NORTHWEST WISCONSIN	0.14
WICHITA FALLS, TX	0.13
REST OF NEVADA	0.12
REST OF AL	0.11
AMARILLO, TX	0.11
NORTHWEST IOWA	0.11
NORTH IDAHO	0.10
REST OF GEORGIA	0.10
S.CEN. IA(EXCL DES MOINES)	0.10
DENTON, TX	0.10
NORTHWEST, IL	0.10

a. MFS impact is percentage gain/loss in payments per service assuming the Medicare Fee Schedule is fully implemented in 1992.

b. The eight payment localities in Los Angeles are treated as a single entry.

APPENDIX J

SELECTED ACCESS ENVIRONMENT CHARACTERISTICS FOR THE LOSING LOCALITIES

TABLE J-1
Medicare Inpatient Physicain Service Casemix
Localities Experiencing Disproportionate Losses

Losing Localities	MFS Impact (a)	Medicare Inpatient Physician Service Casemix
U.S.	-0.06	1.0224
ALASKA	-0.19	n.a.
MONROE, LA	-0.12	0.8480
BALTIMORE/SURR. CNTYS. MD	-0.12	0.9862
ALEXANDRIA, LA	-0.11	0.9883
VICTORIA, TX	-0.12	0.9934
PHILLY/PITT MED SCHS/HOSPS	-0.10	0.9969
CLEVELAND, OH	-0.12	1.0093
MIAMI, FL	-0.23	1.0095
WESTERN RURAL TEXAS	-0.12	1.0129
SHREVEPORT, LA	-0.10	1.0220
KINGS/TULARE, CA	-0.11	1.0255
SMALL GA CITIES 02	-0.12	1.0273
LOS ANGELES, CA (1ST OF 8)	-0.17	1.0369
LOS ANGELES, CA (2ND OF 8)	-0.17	1.0369
LOS ANGELES, CA (3RD OF 8)	-0.17	1.0369
LOS ANGELES, CA (4TH OF 8)	-0.17	1.0369
LOS ANGELES, CA (5TH OF 8)	-0.17	1.0369
LOS ANGELES, CA (6TH OF 8)	-0.17	1.0369
LOS ANGELES, CA (7TH OF 8)	-0.17	1.0369
LOS ANGELES, CA (8TH OF 8)	-0.17	1.0369
BIRMINGHAM, AL	-0.12	1.0376
MANHATTAN, NY	-0.25	1.0386
NEW ORLEANS, LA	-0.10	1.0396
SOUTHEAST RURAL TEXAS	-0.15	1.0457
FLAGSTAFF (CITY), AZ	-0.16	1.0560
HOUSTON, TX	-0.16	1.0602
SAN BERNARDINO/E.CENTRAL CA	-0.16	1.0635
CORPUS CHRISTI, TX	-0.11	1.0666
COLUMBUS, OH	-0.11	1.0671
SAN ANTONIO, TX	-0.15	1.0725
TUCSON (CITY), AZ	-0.12	1.0816
ANAHEIM-SANTA ANA, CA	-0.13	1.0829
MERCED/SURR. CNTYS, CA	-0.12	1.0888
DALLAS, TX	-0.17	1.0889
RIVERSIDE, CA	-0.17	1.0900
HAWAII	-0.16	1.0901
BAKERSFIELD, CA	-0.15	1.0927
SUBURBAN KANSAS CITY, KS	-0.10	1.0979
SACRAMENTO/SURR. CNTYS, CA	-0.10	1.1033
FRESNO/MADERA, CA	-0.13	1.1134
STOCKTON/SURR. CNTYS, CA	-0.14	1.1189
RENO, ET AL (CITIES), NV	-0.15	1.1275
REST OF FLORIDA	-0.12	1.1317
N/NC FLORIDA CITIES	-0.15	1.1394
PHOENIX, AZ	-0.14	1.1403
NE RURAL CA	-0.10	1.1414
SANTA BARBARA, CA	-0.17	1.1421
VENTURA, CA	-0.17	1.1459
FORT LAUDERDALE, FL	-0.19	1.1467
SAN DIEGO/IMPERIAL, CA	-0.18	1.1862
LAS VEGAS,ET AL(CITIES),NV	-0.23	1.2092

a. MFS impact is percentage gain/loss in payments per service assuming the Medicare Fee Schedule is fully implemented in 1992.

TABLE J-2
Percentage of Medicare Population that is Non-White Localities Experiencing Disproportionate Losses

Losing Localities	MFS Impact (a)	Percent Non-White Elderly
U.S.	-0.06	10.85%
HAWAII	-0.16	72.50%
MANHATTAN, NY	-0.25	32.05%
SMALL GA CITIES 02	-0.12	29.37%
BIRMINGHAM, AL	-0.12	29.23%
FLAGSTAFF (CITY), AZ	-0.16	29.05%
NEW ORLEANS, LA	-0.10	28.00%
SHREVEPORT, LA	-0.10	26.93%
MONROE, LA	-0.12	24.93%
ALASKA	-0.19	24.88%
HOUSTON, TX	-0.16	23.83%
LOS ANGELES, CA (1ST OF 8)	-0.17	23.64%
LOS ANGELES, CA (2ND OF 8)	-0.17	23.64%
LOS ANGELES, CA (3RD OF 8)	-0.17	23.64%
LOS ANGELES, CA (4TH OF 8)	-0.17	23.64%
LOS ANGELES, CA (5TH OF 8)	-0.17	23.64%
LOS ANGELES, CA (6TH OF 8)	-0.17	23.64%
LOS ANGELES, CA (7TH OF 8)	-0.17	23.64%
LOS ANGELES, CA (8TH OF 8)	-0.17	23.64%
ALEXANDRIA, LA	-0.11	22.33%
PHILLY/PITT MED SCHS/HOSPS	-0.10	21.10%
BALTIMORE/SURR. CNTYS, MD	-0.12	19.68%
FRESNO/MADERA, CA	-0.13	16.86%
DALLAS, TX	-0.17	16.85%
SAN ANTONIO, TX	-0.15	15.94%
CORPUS CHRISTI, TX	-0.11	14.99%
KINGS/TULARE, CA	-0.11	14.57%
BAKERSFIELD, CA	-0.15	14.27%
VICTORIA, TX	-0.12	14.10%
SOUTHEAST RURAL TEXAS	-0.15	12.81%
CLEVELAND, OH	-0.12	12.68%
STOCKTON/SURR. CNTYS, CA	-0.14	12.32%
COLUMBUS, OH	-0.11	11.90%
MIAMI, FL	-0.23	11.30%
SACRAMENTO/SURR. CNTYS, CA	-0.10	10.08%
SAN BERNARDINO/E.CENTRAL CA	-0.16	10.01%
SAN DIEGO/IMPERIAL, CA	-0.18	9.96%
VENTURA, CA	-0.17	8.76%
MERCED/SURR. CNTYS, CA	-0.12	8.68%
ANAHEIM-SANTA ANA, CA	-0.13	8.00%
LAS VEGAS,ET AL(CITIES),NV	-0.23	7.59%
TUCSON (CITY), AZ	-0.12	7.53%
RIVERSIDE, CA	-0.17	7.22%
WESTERN RURAL TEXAS	-0.12	7.15%
N/NC FLORIDA CITIES	-0.15	6.90%
REST OF FLORIDA	-0.12	5.95%
SANTA BARBARA, CA	-0.17	5.78%
PHOENIX, AZ	-0.14	4.57%
RENO, ET AL (CITIES), NV	-0.15	4.26%
NE RURAL CA	-0.10	3.96%
FORT LAUDERDALE, FL	-0.19	3.62%
SUBURBAN KANSAS CITY, KS	-0.10	1.51%

a. **MFS impact is percentage gain/loss in payments per service assuming the Medicare Fee Schedule is fully implemented in 1992.**

TABLE J-3
Per Capita Income
Localities Experiencing Disproportionate Losses

Losing Localities	MFS Impact (a)	Per Capita Income
U.S.	-0.06	$17,632
FLAGSTAFF (CITY), AZ	-0.16	$11,947
MONROE, LA	-0.12	$12,783
ALEXANDRIA, LA	-0.11	$12,865
REST OF FLORIDA	-0.12	$13,037
CORPUS CHRISTI, TX	-0.11	$13,561
SOUTHEAST RURAL TEXAS	-0.15	$13,602
KINGS/TULARE, CA	-0.11	$13,727
SHREVEPORT, LA	-0.10	$13,735
WESTERN RURAL TEXAS	-0.12	$13,933
SAN ANTONIO, TX	-0.15	$14,053
MERCED/SURR. CNTYS, CA	-0.12	$14,252
NE RURAL CA	-0.10	$14,414
STOCKTON/SURR. CNTYS, CA	-0.14	$14,671
NEW ORLEANS, LA	-0.10	$14,837
BAKERSFIELD, CA	-0.15	$14,856
TUCSON (CITY), AZ	-0.12	$15,203
SMALL GA CITIES 02	-0.12	$15,242
FRESNO/MADERA, CA	-0.13	$15,600
SAN BERNARDINO/E.CENTRAL CA	-0.16	$15,675
VICTORIA, TX	-0.12	$15,749
BIRMINGHAM, AL	-0.12	$16,597
PHILLY/PITT MED SCHS/HOSPS	-0.10	$16,966
RIVERSIDE, CA	-0.17	$17,028
N/NC FLORIDA CITIES	-0.15	$17,128
COLUMBUS, OH	-0.11	$17,698
PHOENIX, AZ	-0.14	$17,705
HOUSTON, TX	-0.16	$17,948
MIAMI, FL	-0.23	$17,964
SACRAMENTO/SURR. CNTYS, CA	-0.10	$18,191
HAWAII	-0.16	$18,363
SAN DIEGO/IMPERIAL, CA	-0.18	$18,402
CLEVELAND, OH	-0.12	$18,504
LAS VEGAS,ET AL(CITIES),NV	-0.23	$18,508
SANTA BARBARA, CA	-0.17	$19,574
DALLAS, TX	-0.17	$19,602
LOS ANGELES, CA (1ST OF 8)	-0.17	$19,906
LOS ANGELES, CA (2ND OF 8)	-0.17	$19,906
LOS ANGELES, CA (3RD OF 8)	-0.17	$19,906
LOS ANGELES, CA (4TH OF 8)	-0.17	$19,906
LOS ANGELES, CA (5TH OF 8)	-0.17	$19,906
LOS ANGELES, CA (6TH OF 8)	-0.17	$19,906
LOS ANGELES, CA (7TH OF 8)	-0.17	$19,906
LOS ANGELES, CA (8TH OF 8)	-0.17	$19,906
VENTURA, CA	-0.17	$20,156
BALTIMORE/SURR. CNTYS, MD	-0.12	$20,352
RENO, ET AL (CITIES), NV	-0.15	$20,827
ALASKA	-0.19	$21,375
FORT LAUDERDALE, FL	-0.19	$21,844
SUBURBAN KANSAS CITY, KS	-0.10	$23,346
ANAHEIM-SANTA ANA, CA	-0.13	$24,288
MANHATTAN, NY	-0.25	$35,193

a. MFS impact is percentage gain/loss in payments per service assuming the Medicare Fee Schedule is fully implemented in 1992.

TABLE J-4
Percentage of Population Uninsured
Localities Experiencing Disproportionate Losses

Losing Localities	MFS Impact (a)	Percentage of Population Uninsured
U.S.	-0.06	13.94%
BALTIMORE/SURR. CNTYS, MD	-0.12	8.08%
HAWAII	-0.16	8.78%
PHILLY/PITT MED SCHS/HOSPS	-0.10	9.21%
CLEVELAND, OH	-0.12	9.34%
SUBURBAN KANSAS CITY, KS	-0.10	10.02%
SMALL GA CITIES 02	-0.12	10.79%
COLUMBUS, OH	-0.11	11.40%
SACRAMENTO/SURR. CNTYS, CA	-0.10	12.40%
BIRMINGHAM, AL	-0.12	15.26%
N/NC FLORIDA CITIES	-0.15	15.56%
MERCED/SURR. CNTYS, CA	-0.12	16.08%
VENTURA, CA	-0.17	16.08%
PHOENIX, AZ	-0.14	16.38%
MANHATTAN, NY	-0.25	16.46%
NE RURAL CA	-0.10	16.68%
SAN DIEGO/IMPERIAL, CA	-0.18	16.77%
SANTA BARBARA, CA	-0.17	16.83%
BAKERSFIELD, CA	-0.15	16.86%
MONROE, LA	-0.12	17.09%
FORT LAUDERDALE, FL	-0.19	17.15%
RIVERSIDE, CA	-0.17	17.35%
STOCKTON/SURR. CNTYS, CA	-0.14	17.36%
LAS VEGAS,ET AL(CITIES),NV	-0.23	17.57%
KINGS/TULARE, CA	-0.11	17.61%
FLAGSTAFF (CITY), AZ	-0.16	17.62%
SAN BERNARDINO/E.CENTRAL CA	-0.16	17.88%
REST OF FLORIDA	-0.12	18.11%
ANAHEIM-SANTA ANA, CA	-0.13	18.14%
TUCSON (CITY), AZ	-0.12	18.60%
FRESNO/MADERA, CA	-0.13	18.69%
HOUSTON, TX	-0.16	18.85%
SHREVEPORT, LA	-0.10	19.70%
ALEXANDRIA, LA	-0.11	19.76%
ALASKA	-0.19	19.79%
RENO, ET AL (CITIES), NV	-0.15	20.31%
NEW ORLEANS, LA	-0.10	20.66%
SOUTHEAST RURAL TEXAS	-0.15	21.82%
VICTORIA, TX	-0.12	22.10%
WESTERN RURAL TEXAS	-0.12	22.10%
DALLAS, TX	-0.17	22.54%
CORPUS CHRISTI, TX	-0.11	23.24%
LOS ANGELES, CA (1ST OF 8)	-0.17	24.25%
LOS ANGELES, CA (2ND OF 8)	-0.17	24.25%
LOS ANGELES, CA (3RD OF 8)	-0.17	24.25%
LOS ANGELES, CA (4TH OF 8)	-0.17	24.25%
LOS ANGELES, CA (5TH OF 8)	-0.17	24.25%
LOS ANGELES, CA (6TH OF 8)	-0.17	24.25%
LOS ANGELES, CA (7TH OF 8)	-0.17	24.25%
LOS ANGELES, CA (8TH OF 8)	-0.17	24.25%
MIAMI, FL	-0.23	24.65%
SAN ANTONIO, TX	-0.15	25.13%

a. MFS impact is percentage gain/loss in payments per service assuming the Medicare Fee Schedule is fully implemented in 1992.

TABLE J-5
Patient Care Physicians per 1000
Localities Experiencing Disproportionate Losses

Losing Localities	MFS Impact (a)	Patient Care Physicians per 1000
U.S.	-0.06	1.90
WESTERN RURAL TEXAS	-0.12	0.57
SOUTHEAST RURAL TEXAS	-0.15	0.72
REST OF FLORIDA	-0.12	0.92
RIVERSIDE, CA	-0.17	1.01
KINGS/TULARE, CA	-0.11	1.02
LAS VEGAS,ET AL(CITIES),NV	-0.23	1.15
BAKERSFIELD, CA	-0.15	1.15
ALASKA	-0.19	1.20
MERCED/SURR. CNTYS, CA	-0.12	1.24
STOCKTON/SURR. CNTYS, CA	-0.14	1.28
NE RURAL CA	-0.10	1.37
FLAGSTAFF (CITY), AZ	-0.16	1.40
FRESNO/MADERA, CA	-0.13	1.47
SAN BERNARDINO/E.CENTRAL CA	-0.16	1.55
VENTURA, CA	-0.17	1.61
MONROE, LA	-0.12	1.73
ALEXANDRIA, LA	-0.11	1.75
FORT LAUDERDALE, FL	-0.19	1.75
N/NC FLORIDA CITIES	-0.15	1.78
PHOENIX, AZ	-0.14	1.85
CORPUS CHRISTI, TX	-0.11	1.89
SACRAMENTO/SURR. CNTYS, CA	-0.10	1.90
VICTORIA, TX	-0.12	1.96
SAN DIEGO/IMPERIAL, CA	-0.18	2.00
HAWAII	-0.16	2.00
RENO, ET AL (CITIES), NV	-0.15	2.03
SANTA BARBARA, CA	-0.17	2.04
DALLAS, TX	-0.17	2.22
SAN ANTONIO, TX	-0.15	2.24
ANAHEIM-SANTA ANA, CA	-0.13	2.24
COLUMBUS, OH	-0.11	2.25
HOUSTON, TX	-0.16	2.33
LOS ANGELES, CA (1ST OF 8)	-0.17	2.35
LOS ANGELES, CA (2ND OF 8)	-0.17	2.35
LOS ANGELES, CA (3RD OF 8)	-0.17	2.35
LOS ANGELES, CA (4TH OF 8)	-0.17	2.35
LOS ANGELES, CA (5TH OF 8)	-0.17	2.35
LOS ANGELES, CA (6TH OF 8)	-0.17	2.35
LOS ANGELES, CA (7TH OF 8)	-0.17	2.35
LOS ANGELES, CA (8TH OF 8)	-0.17	2.35
TUCSON (CITY), AZ	-0.12	2.37
CLEVELAND, OH	-0.12	2.53
SMALL GA CITIES 02	-0.12	2.54
SHREVEPORT, LA	-0.10	2.74
MIAMI, FL	-0.23	2.78
BALTIMORE/SURR. CNTYS, MD	-0.12	2.92
SUBURBAN KANSAS CITY, KS	-0.10	2.98
NEW ORLEANS, LA	-0.10	3.27
BIRMINGHAM, AL	-0.12	3.36
PHILLY/PITT MED SCHS/HOSPS	-0.10	3.51
MANHATTAN, NY	-0.25	7.93

a. MFS impact is percentage gain/loss in payments per service assuming the Medicare Fee Schedule is fully implemented in 1992.

TABLE J-6
Adjusted Total Physician Services per Enrollee
Localities Experiencing Disproportionate Losses

Losing Localities	MFS Impact (a)	Adjusted Total Physician Services per Enrollee
U.S.	-0.06	$990
HAWAII	-0.16	$777
MANHATTAN, NY	-0.25	$846
SACRAMENTO/SURR. CNTYS, CA	-0.10	$880
NE RURAL CA	-0.10	$890
FRESNO/MADERA, CA	-0.13	$896
SHREVEPORT, LA	-0.10	$922
SAN BERNARDINO/E.CENTRAL CA	-0.16	$938
SANTA BARBARA, CA	-0.17	$938
COLUMBUS, OH	-0.11	$942
STOCKTON/SURR. CNTYS, CA	-0.14	$945
WESTERN RURAL TEXAS	-0.12	$948
FLAGSTAFF (CITY), AZ	-0.16	$949
BIRMINGHAM, AL	-0.12	$974
TUCSON (CITY), AZ	-0.12	$998
PHOENIX, AZ	-0.14	$1,004
CLEVELAND, OH	-0.12	$1,018
MERCED/SURR. CNTYS, CA	-0.12	$1,020
BALTIMORE/SURR. CNTYS, MD	-0.12	$1,023
KINGS/TULARE, CA	-0.11	$1,043
SMALL GA CITIES 02	-0.12	$1,050
RIVERSIDE, CA	-0.17	$1,059
SUBURBAN KANSAS CITY, KS	-0.10	$1,071
MONROE, LA	-0.12	$1,081
SOUTHEAST RURAL TEXAS	-0.15	$1,091
ALEXANDRIA, LA	-0.11	$1,099
SAN DIEGO/IMPERIAL, CA	-0.18	$1,117
PHILLY/PITT MED SCHS/HOSPS	-0.10	$1,130
DALLAS, TX	-0.17	$1,145
BAKERSFIELD, CA	-0.15	$1,148
VENTURA, CA	-0.17	$1,158
SAN ANTONIO, TX	-0.15	$1,158
REST OF FLORIDA	-0.12	$1,160
N/NC FLORIDA CITIES	-0.15	$1,174
ANAHEIM-SANTA ANA, CA	-0.13	$1,179
LAS VEGAS,ET AL(CITIES),NV	-0.23	$1,205
RENO, ET AL (CITIES), NV	-0.15	$1,217
HOUSTON, TX	-0.16	$1,242
VICTORIA, TX	-0.12	$1,250
CORPUS CHRISTI, TX	-0.11	$1,269
LOS ANGELES, CA (1ST OF 8)	-0.17	$1,274
LOS ANGELES, CA (2ND OF 8)	-0.17	$1,274
LOS ANGELES, CA (3RD OF 8)	-0.17	$1,274
LOS ANGELES, CA (4TH OF 8)	-0.17	$1,274
LOS ANGELES, CA (5TH OF 8)	-0.17	$1,274
LOS ANGELES, CA (6TH OF 8)	-0.17	$1,274
LOS ANGELES, CA (7TH OF 8)	-0.17	$1,274
LOS ANGELES, CA (8TH OF 8)	-0.17	$1,274
FORT LAUDERDALE, FL	-0.19	$1,391
NEW ORLEANS, LA	-0.10	$1,460
MIAMI, FL	-0.23	$1,966
ALASKA	-0.19	$2,217

a. **MFS impact is percentage gain/loss in payments per service assuming the Medicare Fee Schedule is fully implemented in 1992.**

TABLE J-7
Percentage of Population Insured with Medicare
Localities Experiencing Disproportionate Losses

Losing Localities	MFS Impact (a)	Percentage of Population Insured with Medicare
U.S.	-0.06	12.75%
ALASKA	-0.19	3.91%
HOUSTON, TX	-0.16	7.03%
RENO, ET AL (CITIES), NV	-0.15	8.38%
DALLAS, TX	-0.17	8.40%
FLAGSTAFF (CITY), AZ	-0.16	8.48%
ANAHEIM-SANTA ANA, CA	-0.13	8.88%
SAN BERNARDINO/E.CENTRAL CA	-0.16	9.12%
SUBURBAN KANSAS CITY, KS	-0.10	9.16%
VENTURA, CA	-0.17	9.26%
LOS ANGELES, CA (1ST OF 8)	-0.17	9.46%
LOS ANGELES, CA (2ND OF 8)	-0.17	9.46%
LOS ANGELES, CA (3RD OF 8)	-0.17	9.46%
LOS ANGELES, CA (4TH OF 8)	-0.17	9.46%
LOS ANGELES, CA (5TH OF 8)	-0.17	9.46%
LOS ANGELES, CA (6TH OF 8)	-0.17	9.46%
LOS ANGELES, CA (7TH OF 8)	-0.17	9.46%
LOS ANGELES, CA (8TH OF 8)	-0.17	9.46%
SAN ANTONIO, TX	-0.15	9.64%
LAS VEGAS,ET AL(CITIES),NV	-0.23	10.20%
COLUMBUS, OH	-0.11	10.28%
CORPUS CHRISTI, TX	-0.11	10.29%
BAKERSFIELD, CA	-0.15	10.39%
HAWAII	-0.16	10.44%
KINGS/TULARE, CA	-0.11	10.60%
SAN DIEGO/IMPERIAL, CA	-0.18	10.65%
MERCED/SURR. CNTYS, CA	-0.12	10.85%
FRESNO/MADERA, CA	-0.13	10.98%
SACRAMENTO/SURR. CNTYS, CA	-0.10	11.14%
VICTORIA, TX	-0.12	11.56%
BALTIMORE/SURR. CNTYS, MD	-0.12	11.69%
MONROE, LA	-0.12	11.81%
SOUTHEAST RURAL TEXAS	-0.15	11.87%
SMALL GA CITIES 02	-0.12	11.99%
NEW ORLEANS, LA	-0.10	12.08%
PHOENIX, AZ	-0.14	12.12%
SHREVEPORT, LA	-0.10	12.40%
STOCKTON/SURR. CNTYS, CA	-0.14	12.44%
RIVERSIDE, CA	-0.17	12.67%
MANHATTAN, NY	-0.25	12.71%
ALEXANDRIA, LA	-0.11	12.72%
SANTA BARBARA, CA	-0.17	12.73%
TUCSON (CITY), AZ	-0.12	13.24%
MIAMI, FL	-0.23	13.32%
WESTERN RURAL TEXAS	-0.12	14.45%
CLEVELAND, OH	-0.12	14.59%
BIRMINGHAM, AL	-0.12	15.19%
NE RURAL CA	-0.10	15.70%
N/NC FLORIDA CITIES	-0.15	15.77%
PHILLY/PITT MED SCHS/HOSPS	-0.10	16.60%
REST OF FLORIDA	-0.12	20.32%
FORT LAUDERDALE, FL	-0.19	20.72%

a. MFS impact is percentage gain/loss in payments per service assuming the Medicare Fee Schedule is fully implemented in 1992.

TABLE J-8
Percentage of Allowed Charges Participating
Localities Experiencing Disproportionate Losses

Losing Localities	MFS Impact (a)	Percentage of Allowed Charges Participating
U.S.	-0.06	0.6998
SANTA BARBARA, CA	-0.17	0.4728
FLAGSTAFF (CITY), AZ	-0.16	0.5168
WESTERN RURAL TEXAS	-0.12	0.5275
MANHATTAN, NY	-0.25	0.5330
KINGS/TULARE, CA	-0.11	0.5678
MERCED/SURR. CNTYS, CA	-0.12	0.5893
FORT LAUDERDALE, FL	-0.19	0.6084
ALASKA	-0.19	0.6098
DALLAS, TX	-0.17	0.6186
MONROE, LA	-0.12	0.6224
NE RURAL CA	-0.10	0.6277
FRESNO/MADERA, CA	-0.13	0.6341
SHREVEPORT, LA	-0.10	0.6426
PHOENIX, AZ	-0.14	0.6557
RIVERSIDE, CA	-0.17	0.6617
HOUSTON, TX	-0.16	0.6696
SOUTHEAST RURAL TEXAS	-0.15	0.6697
SAN ANTONIO, TX	-0.15	0.6754
CORPUS CHRISTI, TX	-0.11	0.6778
HAWAII	-0.16	0.6837
N/NC FLORIDA CITIES	-0.15	0.7162
ANAHEIM-SANTA ANA, CA	-0.13	0.7280
SMALL GA CITIES 02	-0.12	0.7339
REST OF FLORIDA	-0.12	0.7383
VICTORIA, TX	-0.12	0.7412
LOS ANGELES, CA (5TH OF 8)	-0.17	0.7436
LOS ANGELES, CA (8TH OF 8)	-0.17	0.8287
LOS ANGELES, CA (1ST OF 8)	-0.17	0.8328
LOS ANGELES, CA (2ND OF 8)	-0.17	0.8630
LOS ANGELES, CA (4TH OF 8)	-0.17	0.8818
LOS ANGELES, CA (6TH OF 8)	-0.17	0.8926
LOS ANGELES, CA (3RD OF 8)	-0.17	0.9120
LOS ANGELES, CA (7TH OF 8)	-0.17	0.9154
STOCKTON/SURR. CNTYS, CA	-0.14	0.7593
SAN DIEGO/IMPERIAL, CA	-0.18	0.7817
TUCSON (CITY), AZ	-0.12	0.7872
CLEVELAND, OH	-0.12	0.7881
SACRAMENTO/SURR. CNTYS, CA	-0.10	0.7888
COLUMBUS, OH	-0.11	0.7999
VENTURA, CA	-0.17	0.7999
MIAMI, FL	-0.23	0.8213
SAN BERNARDINO/E.CENTRAL CA	-0.16	0.8227
BAKERSFIELD, CA	-0.15	0.8370
BALTIMORE/SURR. CNTYS, MD	-0.12	0.8543
NEW ORLEANS, LA	-0.10	0.8557
RENO, ET AL (CITIES), NV	-0.15	0.8583
SUBURBAN KANSAS CITY, KS	-0.10	0.8590
ALEXANDRIA, LA	-0.11	0.8811
BIRMINGHAM, AL	-0.12	0.9334
LAS VEGAS,ET AL(CITIES),NV	-0.23	0.9506
PHILLY/PITT MED SCHS/HOSPS	-0.10	0.9535

a. MFS impact is percentage gain/loss in payments per service assuming the Medicare Fee Schedule is fully implemented in 1992.

TABLE J-9
Medicare Fees Relative to Private Fees, All Services
Localities Experiencing Disproportionate Losses

Losing Localities	MFS Impact (a)	Physician Fee Index
U.S.	-0.06	0.7580
MANHATTAN, NY	-0.25	0.5503
MIAMI, FL	-0.23	0.5633
LOS ANGELES, CA (1ST OF 8)	-0.17	0.6194
LOS ANGELES, CA (2ND OF 8)	-0.17	0.6194
LOS ANGELES, CA (3RD OF 8)	-0.17	0.6194
LOS ANGELES, CA (4TH OF 8)	-0.17	0.6194
LOS ANGELES, CA (5TH OF 8)	-0.17	0.6194
LOS ANGELES, CA (6TH OF 8)	-0.17	0.6194
LOS ANGELES, CA (7TH OF 8)	-0.17	0.6194
LOS ANGELES, CA (8TH OF 8)	-0.17	0.6194
HAWAII	-0.16	0.6387
ANAHEIM-SANTA ANA, CA	-0.13	0.6518
LAS VEGAS,ET AL(CITIES),NV	-0.23	0.6549
BALTIMORE/SURR. CNTYS, MD	-0.12	0.6583
HOUSTON, TX	-0.16	0.6590
DALLAS, TX	-0.17	0.6633
SAN DIEGO/IMPERIAL, CA	-0.18	0.6645
FORT LAUDERDALE, FL	-0.19	0.6675
SANTA BARBARA, CA	-0.17	0.6680
PHILLY/PITT MED SCHS/HOSPS	-0.10	0.6709
SAN BERNARDINO/E.CENTRAL CA	-0.16	0.6726
RIVERSIDE, CA	-0.17	0.6845
VENTURA, CA	-0.17	0.6874
BAKERSFIELD, CA	-0.15	0.6923
TUCSON (CITY), AZ	-0.12	0.6994
CORPUS CHRISTI, TX	-0.11	0.7050
FLAGSTAFF (CITY), AZ	-0.16	0.7066
PHOENIX, AZ	-0.14	0.7069
KINGS/TULARE, CA	-0.11	0.7094
SAN ANTONIO, TX	-0.15	0.7114
MERCED/SURR. CNTYS, CA	-0.12	0.7165
ALASKA	-0.19	0.7200
STOCKTON/SURR. CNTYS, CA	-0.14	0.7224
FRESNO/MADERA, CA	-0.13	0.7238
REST OF FLORIDA	-0.12	0.7261
N/NC FLORIDA CITIES	-0.15	0.7264
SOUTHEAST RURAL TEXAS	-0.15	0.7289
SACRAMENTO/SURR. CNTYS, CA	-0.10	0.7484
SMALL GA CITIES 02	-0.12	0.7508
RENO, ET AL (CITIES), NV	-0.15	0.7513
MONROE, LA	-0.12	0.7538
BIRMINGHAM, AL	-0.12	0.7544
CLEVELAND, OH	-0.12	0.7569
NEW ORLEANS, LA	-0.10	0.7601
NE RURAL CA	-0.10	0.7752
SHREVEPORT, LA	-0.10	0.7852
COLUMBUS, OH	-0.11	0.8138
WESTERN RURAL TEXAS	-0.12	0.8145
ALEXANDRIA, LA	-0.11	0.8210
SUBURBAN KANSAS CITY, KS	-0.10	0.8262
VICTORIA, TX	-0.12	0.8276

a. MFS impact is percentage gain/loss in payments per service assuming the Medicare Fee Schedule is fully implemented in 1992.

APPENDIX K

DESCRIPTION OF SIMULATION METHODS

The purpose of the simulation is to simulate the locality-level impacts of the Medicare Fee Schedule (MFS) and various alternatives to the MFS (e.g., a 100 percent GPCI adjustment to the work component). The simulations estimate the impact of the MFS on payments per service. More precisely, it is assumed that the volume and mix of services remains constant. One locality impact is simulated, "the 1996 impact" which assumes full implementation of the MFS in 1992. Although technically a misnomer, the term "1996 impact" is used to be consistent with the HHS regulatory impact analysis.

Data. The data used for the simulation is the HCFA Public Use File (PUF) of Physician Services consistent with the final version of the MFS regulation (*Federal Register* November 25, 1991).[1] The PUF is constructed by aging (as described in the *Federal Register*) the 1989 BMAD procedure file.[2] For each unique carrier, locality, procedure, modifier, and specialty combination, the PUF includes:

- 1989 allowed services;
- 1991 simulated allowed charges;
- work, practice expense, and malpractice relative values units (RVUs) for each procedure; and
- work, practice expense, and malpractice geographic cost of practice index (GPCI) values for each locality.

The PUF does not include records for anesthesia bills. Two carriers, Railroad Board (10071) and Puerto Rico (00973)[3] were not included in the file and the Minnesota Travelers (10240) carrier was re-coded and combined with Minnesota (00720). Regarding localities:

- consistent with the final rule, Nebraska (00655), Oklahoma (01370) and Minnesota (00720) are single state-wide localities in this file;

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[1] Unless otherwise noted, all *Federal Register* references hereafter refer to the final November 25, 1991 rule.

[2] The MFS is required by law to be implemented in a budget neutral fashion relative to 1991. To obtain "1991" physician data, 1989 BMAD data are "aged" forward to 1991. Aging reflects changes in enrollment, fees, and numbers of services that occur from year-to-year, as well as adjustments for legislative changes in the intervening years (i.e. the Omnibus Budget Reconciliation Acts of 1989 and 1990).

[3] Puerto Rico is not included in the PUF because HCFA concluded its data were unreliable.

- five California localities[4] that are served by the Occidental (02050) have a small number of records processed by the California Blue Shield (00542) carrier--all records for these localities were combined with Occidental data for the same localities.

Computing MFS Payments. Conceptually, simulating the locality-level MFS impact is simple. First, for each unique locality/procedure combination, one calculates the payment per service under the MFS as:

$$PS_{pl} = [(RVU_{wp} * GPCI_{wl}) + (RVU_{op} * GPCI_{ol}) + (RVU_{mp} * GPCI_{ml})] * CF$$

where PS refers to payment per service, RVU is the relative value unit for the procedure, GPCI is the geographic index value for the locality, subscript w refers to the work component, subscript o refers to the practice expense (overhead) component, subscript m refers to the malpractice component, subscript p refers to the procedure (plus modifier), subscript l refers to the locality, and CF refers to the conversion factor published in the Federal Register. Second, an average payment per service, (weighted by number of services) is calculated across all procedures in the locality and compared to the weighted average allowed charge for the locality under reasonable charge rules. However, simulating the locality-level impact is not as simple as this process suggests because the allowed charges and the CF must be updated and adjusted for various factors.

Adjusting Allowed Charges and the CF. The PUF file includes 1991 simulated allowed charges. To simulate 1992 MFS impacts, allowed charges must be updated to 1992. The 1991 CF was updated to 1992 by 1.9 percent (see Federal Register p. 59512), thus we update the 1991 allowed charge to 1992 by the same amount. This updated figure is referred to as the 1992 allowed charge and is the comparison point for the simulated MFS impacts. That is, MFS payments per service in 1996 (fully implemented MFS) will be compared to allowed charges per service in 1992 to determine the MFS impact.

To undertake the simulation, the CF must also be adjusted. For the 1996 impact, the CF is adjusted to reflect adjustments in payments for nonparticipating physicians. Under the MFS, nonparticipating physicians are reimbursed 95 percent of the MFS amount (see Federal Register p. 59517). In simulating the locality-level impacts, a 2 percent reduction in the CF is made to take into account the nonparticipating physician payment differential and the proportion of nonparticipating physicians nationwide.

[4] The five localities are: Santa Barbara, Ventura, Los Angeles (4th and 5th of 8), and Anaheim-Santa Ana.